



MADROÑO

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SPECIAL ISSUE

CONTRIBUTIONS TOWARD A BRYOFLOA OF CALIFORNIA, PART IV

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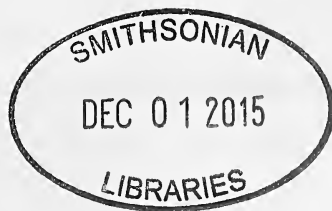
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INTRODUCTION

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California is one of the bryological hot spots of North America. Currently, the California bryoflora consists of approximately 800 species (650 mosses; 160 liverworts/hornworts). The California Floristic Province (CFP) portion of the state is influenced by a Mediterranean climate, and therefore, the California bryoflora has affinities with other regions of the world with a similar climate of wet winters and hot, dry summers. Many bryophytes documented for California are currently known from only a few collections, and large areas of the state have not been adequately explored. As more of California is systematically sampled for bryophytes, additional taxa will be determined to represent first records for the state, first records for North America, or described as species new to science. The pace of discovery of bryophyte species, understanding of distributions, and advancement of ecology is far behind that of the California vascular flora, due primarily to fewer field bryologists. Nonetheless, efforts like the three bryofloras presented here continue to advance our understanding of bryophytes in California and the role this refined awareness will contribute toward long-term conservation. The nature of bryophyte distributions in California is generally one of widely spaced occurrences with many species confined to specific microhabitats. Rare and uncommon bryophytes in California often occur in isolated, small populations disjunct from the center of their range. Some California bryophytes are likely to be viewed as relictual taxa confined to narrow and isolated microhabitats while others are considered to represent Pacific Slope endemics.

This issue of *Madroño* offers three examples of the importance of conducting localized bryofloras. The focus of each bryoflora is on a different land unit type. Carter covers the combined southern and northern Channel Islands off the southern California coast that are within multiple counties and other jurisdictions, Toren uses a county boundary (Lake) within an area of the northern Coast Ranges, and Dillingham inventories a national forest at the juncture of the southern Cascades and northern Sierra Nevada. These bryofloras are geographically separated and describe bryophyte communities based on differences on vegetation types ranging from coastal scrub and chaparral to montane coniferous forests. In addition, these bryofloras cover a very small geographic portion of

the CFP and each offers much information on species distributions and habitat preferences. An important message that each of these bryofloras presents is that many species are rare on the landscape within the unit studied, and therefore, the probability of localized extirpations can be relatively high. These bryofloras share another attribute; they each contain a large percentage of the state's bryoflora in a remarkably small geographic area. In comparison, where could we find nearly 30 to 40 percent of the vascular flora of the state on one percent (or less) of the landscape?

Bryophytes offer many inventory challenges since they are generally small plants and most of the diagnostic features used to separate species require greater magnification than offered with a hand-lens or dissecting microscope. Nonetheless, with practice and experience, one can learn and recognize common and widespread bryophytes in the field. However, the importance and value of properly prepared bryophyte voucher specimens deposited in California herbaria cannot be overstated. Collections are paramount to document the California bryoflora. Some California bryophytes are known from a single occurrence and the next documented occurrence may be thousands of miles away, and in a few cases, even occur on a different continent. This is why the development of localized bryofloras across California is so important. The botanist working at a watershed, mountain range, or administrative unit can survey an area more systematically and locate as many unusual microhabitats across the landscape as possible. Careful collection will ensure new discoveries. Due to the nature of bryophyte establishment by spores or small plant fragments, there is a high potential to encounter species that arrived millennia ago in California and are just waiting to be discovered. It is also exceedingly hard to predict which species could occur in California.

I hope these three bryofloras will encourage other botanists to take up the challenge and inventory one of their favorite landscapes. Working on a bryoflora is indeed a time-consuming research endeavor, but well worth doing because many wonderful discoveries will be made along the way. We are fortunate to have these three new bryofloras that contribute to our understanding of the California bryoflora.

A CHECKLIST OF THE BRYOPHYTES OF THE CALIFORNIA CHANNEL ISLANDS

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ABSTRACT

An annotated, vouchered checklist of the bryophytes of the California Channel Islands is presented, including the known distribution of each species across the eight islands. The bryoflora currently comprises 158 minimally ranked taxa. Fifty-nine mosses, two hornworts, and twenty-two liverworts are reported for the first time from the islands. Fifteen species previously reported from the archipelago are excluded based on new determinations and nomenclatural changes. The bryoflora includes two putative undescribed species in the Bryaceae, *Plagiobryoides* sp. from Santa Catalina Island and *Gemmabryum* sp. from Santa Rosa Island. Excluding these two putative new species, no new state records are reported. One species, *Tortula californica*, is listed by the California Native Plant Society at the 1B rank. Previous reports from the literature are catalogued and nomenclatural changes are noted. There are no island endemics, with the possible exception of the two putative undescribed species. The bryoflora is similar to that of the adjacent mainland, but the larger islands harbor disjunct populations of species from the wet forests of central and northern California that are absent on the adjacent mainland.

Key Words: Disjunction, floristics, inventory, liverworts, mosses, rare species.

With more than 750 species in California, the bryophytes (mosses, liverworts, and hornworts) comprise roughly 12 percent of the state's native flora (Norris and Shevock 2004a; Doyle and Stotler 2006; Baldwin et al. 2012). Despite their significant contribution to diversity in the region, basic floristic knowledge lags far behind that of the vascular flora (Kellman 2003; Shevock 2003). This is particularly true in southern California where the bryophyte diversity tends to be less conspicuous than in the northern parts of the state.

The California Channel Islands exemplify the difference in effort placed in understanding the vascular and non-vascular floras. Vascular plant species lists have been published for all the islands (Wallace 1985, and references therein) and there is a long history of employing the islands as a system to understand biogeography and floristic assembly in southern California (Axelrod 1967b; Raven 1967; Moody 2000). In contrast, the most recent floristic treatment of the bryophyte flora of the islands (McCleary 1972) listed only 76 species, 26% of which were documented from a single island, with most of these collected on a single collecting trip (Steere 1954).

The purpose of the present study is to provide an updated list of the bryophytes of the islands based on recent collecting efforts and re-examination of existing herbarium specimens. The scattered literature on the Channel Island bryophyte flora is summarized, and several species are excluded based on reevaluation of earlier misidentified specimens.

Study site. The Channel Islands consist of an archipelago of eight islands off the coast of Southern California (Fig. 1). They range in size from 2.6 to 249 km² and are located between 20 and 98 km from the mainland (Schoenherr et al. 1999). They range in latitude from 32.8°N to 34.1°N and in maximum elevation from 253 m to 753 m. Although they are near the mainland and emerge from the continental shelf, they have not been connected to the mainland since they rose above sea level. Because of this, all the terrestrial plant species either arrived by wind, by floating across the channel, or were transported by animals or humans. Although the islands have not been connected to the mainland, during the last glacial maximum the four northern islands were connected to form a single large island and the distance between this larger island (called Santa Rosae) and the mainland was reduced to as little as seven km (Schoenherr et al. 1999). In contrast, the four southern islands have been isolated throughout their existence above sea level. Due to a complicated tectonic history in the region, geology on the islands is complex. The majority of the bedrock is made up of igneous gabbros and basalts, as well as schists and other metamorphic rocks derived from these. Sedimentary rocks are less common. Limestones and marbles are not known from the islands, but calcareous travertine deposits are not uncommon in streambeds. Serpentine is restricted to very limited areas on Santa Catalina, and granitic rocks are also very limited and occur primarily on Santa Catalina.

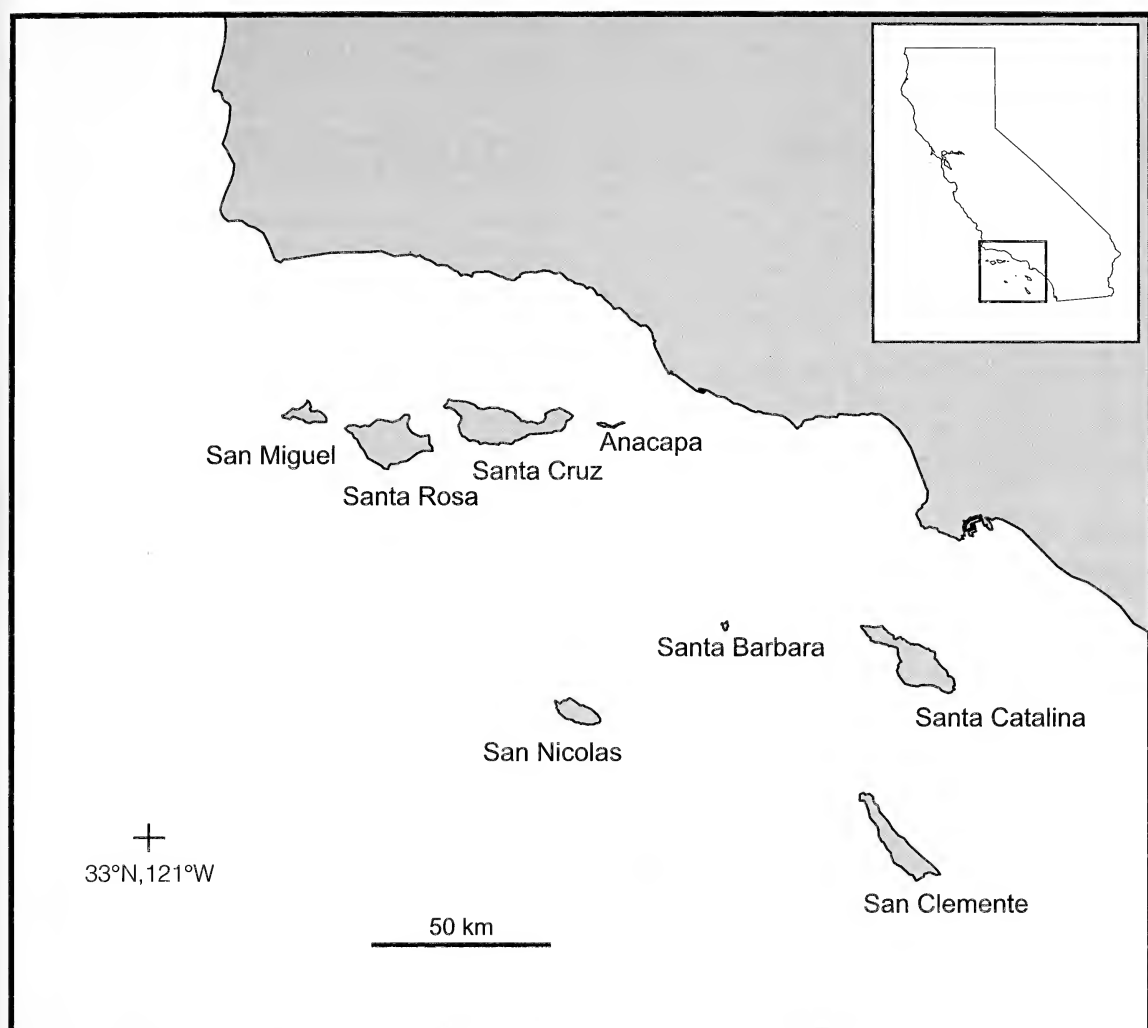


FIG. 1. The California Channel Islands.

Climate is roughly similar to climates on the adjacent mainland, although fog plays a more significant role. Climate varies substantially among islands depending on their position relative to the continent and to their elevation. For example San Miguel, as a low island at the outer edge of the archipelago, receives more fog but also substantially more wind than the other islands. Santa Cruz, on the other hand, receives much more moisture through fog accumulation and rainfall due to its higher elevation than the other islands. Throughout the islands, a general trend is for upper elevations, north facing slopes, and slopes facing the channel (as opposed to the ocean) to be more mesic, presumably due a greater impact of fog, than other areas. Temperatures are comparable to coastal southern California with freezing temperatures occurring with regularity only in inland valleys of the larger islands.

Vascular plant diversity on the islands ranges from 88 to 480 taxa (Schoenherr et al. 1999). The vegetation on the islands is broadly similar to that on the adjacent mainland, but has several differences that are relevant to the bryophyte flora. The dominant vegetation types are shrub dominated chaparral and coastal scrub communities and extensive non-native grasslands. Although the dominant vascular plant genera are mostly the same as those on the mainland, many of the common woody species are island endemics (e.g., *Acmispon* Raf. [= *Lotus* L.], *Arctostaphylos* Adans., *Ceanothus* L., *Eriogonum* Michx., *Quercus* L., *Rhamnus* L.). The islands also support relictual vegetation types that were at one time more common on the adjacent mainland, but are now unique in southern California. On one extreme of the moisture gradient are the Bishop pine (*Pinus muricata* D. Don) forests (best developed on Santa Cruz Island) which, maintained

by maritime fog, support a number of vascular and bryophyte species that can now mostly be found farther north on the mainland but are mostly absent on the adjacent mainland. On the other extreme is the succulent coastal scrub (dominated by *Artemisia* L., *Bergerocactus* Britton & Rose, *Lycium* L., *Opuntia* Mill., and others) that on the mainland is mostly now restricted to areas south of San Diego. This unique assemblage of vegetation types provides an array of microhabitats available to bryophytes that is somewhat different from those on the adjacent mainland.

The islands also have a long history of very heavy grazing pressure by introduced cows, sheep, deer, and goats (Schoenherr et al. 1999). While this pressure has had a marked impact on the distribution and population sizes of native vascular plants, especially island endemics, the extent to which the bryophyte flora was affected is unknown.

METHODS

Collecting trips were made to the islands sporadically from 2010 to 2015, and collections are deposited at UC. Six of the eight islands (all except San Nicolas and Santa Barbara) were visited at least once. Herbarium specimens were examined from CAS, F, NY, SBBG, UBC, and UC. In 2011, C. Villaseñor made the first, and to date only, important systematic bryophyte collections from west Anacapa Island and kindly donated them to the project. These were identified by the author and are also housed at UC.

Nomenclature for the mosses generally follows the Flora of North America, except in a few cases (e.g., the *Orthotrichum tenellum* complex). Deviations from the Flora of North America are noted and discussed in Appendix 1. Nomenclature for the liverworts and hornworts follows Doyle and Stotler (2006). Where species authorities differ between TROPICOS (www.tropicos.org, accessed 15 April 2015), the Flora of North America (mosses), or Doyle and Stotler (liverworts and hornworts, 2006), the authority from TROPICOS is listed. For each species in Appendix 1, all the synonyms used in earlier publications on the Channel Islands, along with the reference to the specific publication, are provided.

RESULTS

History of Bryophyte Collecting on the Islands

Unlike most of southern California, the Channel Islands have a relatively well-documented history of collecting. The earliest report in the literature of bryophytes collected on the islands is based on collections made by J. McClatchie in 1893 from near Avalon on Santa Catalina. From

those collections, two liverworts were described, *Riccia catalinae* Underwood (1894) (= *Riccia cavernosa* Hoffm.) and *Frullania catalinae* Evans ([1897] 1900). An additional three species were collected in 1910, also near Avalon, by C. C. Kingman: *Riccia trichocarpa* M. Howe, *Targionia hypophylla* L., and *Anthoceros fusiformis* Austin (Kingman 1911). Kingman (1912) subsequently published a list of mosses of Southern California, including five species originally reported by McClatchie. Of these, *Didymodon tophaceus* (Brid.) Lisa, *D. vinealis* (Brid.) R.H. Zander (as *Barbula vinealis* Brid.), and *Rosulabryum capillare* (Hedw.) J.R. Spence (as *Bryum obconicum* Nees) were reported from Santa Catalina Island. The next mention of the bryoflora of the islands came in a flora of Santa Catalina (Millspaugh and Nuttall 1923). This work focused on vascular plants, but included bryophytes (as well as fungi and lichens). Twenty-six mosses were reported from the island in addition to five thalloid, two leafy liverworts, and a single hornwort species, with identifications and taxonomic treatments of the mosses by R. S. Williams, and those for the hepatics and hornworts by A. W. Evans. The treatments were based primarily on collections throughout the island from 1920 to 1922 by Knopf, Nuttall, and Millspaugh, but were supplemented by the earlier collections of Kingman and McClatchie. Most of these specimens are now at NY.

A decade later J. T. Howell, with the Templeton Crocker Expedition to the Galapagos Islands, collected three mosses on San Nicolas Island in March 1932. These specimens, representing *Didymodon brachyphyllus* (Sull.) R.H. Zander (as *Barbula brachyphylla* Sull.), *Crossidium crassinervium* (De Not.) Jur. (as *C. desertorum* Holz. & E.B. Bartram) and *Entosthodon bolanderi* Lesq. (as *Funaria bolanderi* [Lesq.] Holz.), were sent to E. B. Bartram for identification and publication (Bartram 1933) and are now at CAS.

Two more reports from the islands followed this in A. J. Grout's Moss Flora of North America (1928–1940), (*Homalothecium arenarium* [Lesq.] E. Lawton and *Scleropodium californicum* [Lesq.] Kindb., both from Santa Catalina), but no further publications on the Channel Island Bryoflora appeared until G. Sayre (1940) produced a list of all the mosses known from the "Santa Barbara Islands" at the time. This list included 39 mosses, 10 of which were new records for the islands. Even with the relatively meager information available at the time, Sayre was importantly the first to note the absence of endemic bryophytes on the Channel Islands in contrast to the high proportion of island endemic vascular plants. The ten new additions to Sayre's list were based on specimens collected by T. D. A. Cockerell (although vouchers were not cited), who made a few collections on all but Anacapa and Santa

Rosa islands in the late 1930's (Cockerell 1939). Most of these specimens have not been relocated. Sayre's list did not incorporate a number of collections that had been made in 1929 and 1930 by R. Hoffmann and F. Fosberg, two vascular plant collectors who sent their bryophytes to Bartram for identification.

The first systematic collecting on any of the islands occurred in 1953 when the bryologist W. C. Steere joined an annual field meeting held jointly by the California Botanical Society and the Southern California Botanists. The expedition visited Santa Catalina Island for three days in May, and Steere collected thoroughly the watershed above White's Landing, approximately five miles north of Avalon. He found nearly sixty species of bryophytes, thus almost doubling the number of species known from Santa Catalina with only three days of collecting in a relatively limited area. He published an updated list of all the bryophytes known from Santa Catalina (Steere 1954), which does not provide specimen voucher numbers, but does include substantial ecological and nomenclatural information for many of the listed species. Steere was able to make the first informed biogeographical observations regarding the bryoflora of the islands and noted that most species on Catalina were common xerophytic species, but that there were clear links to the much wetter northern California and high elevation southern California floras. Steere (1954) stated that his vouchers were deposited in the Stanford herbarium. Some of these have been relocated at CAS and UBC but many have not yet been relocated.

The most recent publication on the Channel Island bryophyte flora was another list of all the moss species known from the islands (McCleary 1972). This work built on the previous publications as well as the unpublished collections of Fosberg and Hoffmann and new collections by E. R. Blakely, a staff member of the Santa Barbara Botanical Garden who sent collections to McCleary at Northern Illinois University for identification. McCleary's list included eleven species new to the islands and a total of 76 species. Specific vouchers were not cited, but the known distribution of each of the 76 species across the eight islands was provided.

In recent years there have been a few scattered and mostly incidental collections, primarily by vascular plant and lichen collectors. Before this current study, the only systematic collecting trip was undertaken by J. Shevock and D. Norris in 2001 in which they collected a combined 450 specimens from Santa Rosa Island. Collections by Norris are housed at UC, and the primary set of Shevock collections is at CAS, with synoptic sets at UC and SBBG.

Floristic Summary

The study resulted in approximately 2150 new collections and a checklist of 157 species and one subspecies from the islands (summarized in Table 1, see also Appendix 1). Currently there are no endemic bryophyte taxa recognized from the islands, however putative undescribed species of *Plagiobryoides* J.R. Spence and *Gemmabryum* J. R. Spence & H.P. Ramsay were collected from Santa Catalina and Santa Rosa, and have not yet been collected on the mainland. Eighty-three species and one subspecies are reported here for the first time from the Channel Islands (59 mosses, two hornworts, 22 liverworts). Additionally, the distributions of 60 species previously recorded from the islands (51 mosses, eight liverworts, one hornwort) are expanded to islands from which they were not previously known.

All species in the checklist have been previously reported from California. Fifteen species previously reported from the islands are excluded based on re-identification of voucher specimens and on updated species circumscriptions (Appendix 2). Several historical reports could not be verified due to the absence of the original voucher and a lack of recent collections. When credible, these unvouchered reports were included in Table 1 with a plus sign (+) rather than an "X". One species from the islands, *Tortula californica* E.B. Bartram, is recognized by the California Native Plant Society (CNPS, Rare Plant Program 2014) as a rare species with a rank of 1B (Rare, Threatened, or Endangered in California and elsewhere).

The Channel Island flora is typical of southern coastal California. The most diverse families are Pottiaceae (39 species), Bryaceae (21), Brachytheciaceae (11), and Orthotrichaceae (8). Together these four families comprise approximately half the bryophyte flora. The important genera are *Gemmabryum* (10 species), *Tortula* Hedw. (9), *Orthotrichum* Hedw. (8), *Riccia* L. (7), and *Scleropodium* Bruch & Schimp. (6). *Didymodon* F. Weber & D. Mohr ex Braithw., *Rosulabryum* J. R. Spence, and *Syntrichia* Brid. each have five species.

DISCUSSION

There is much work left to do in cataloging the bryophyte flora of the Channel Islands. Although this study more than doubles the number of species known from the archipelago, there are undoubtedly many more discoveries to be made. Even with this caveat, several biogeographic patterns are evident.

Species common in northern and central California that are absent on the adjacent mainland are an important component of the island flora. These are mostly associated with *Pinus muricata* forests on Santa Cruz and Santa Rosa Islands and to a lesser extent with stands of the island

TABLE 1. BRYOPHYTES OF THE CHANNEL ISLANDS. An 'X' indicates a vouchered occurrence of a species on an island. A '+' indicates an unvouchered but credible report or observation. See Appendix 1 for vouchers and nomenclatural details. Island abbreviations are Ana = Anacapa, SBa = Santa Barbara, SCa = Santa Catalina, SCl = San Clemente, SCz = Santa Cruz, SMi = San Miguel, SNi = San Nicolas, SRO = Santa Rosa. Excluded species are listed in Appendix 2.

Family	Taxon	Ana	SBa	SCa	SCl	SCz	SMi	SNi	SRO
MOSESSES									
Amblystegiaceae	<i>Amblystegium serpens</i>			X					
	<i>Conardia compacta</i>			X		X			
	<i>Hygrohypnum bestii</i>			X		X			
Bartramiaceae	<i>Leptodictyum riparium</i>					X			
	<i>Anacolia menziesii</i> var. <i>baueri</i>	X		X	X	X			X
	<i>Bartramia aprica</i>			X					
Brachytheciaceae	<i>Brachythecium bolanderi</i>			X		X			
	<i>Homalothecium arenarium</i>	X	X	X	X	X	X		X
	<i>Homalothecium nuttallii</i>			X	X	X			X
	<i>Homalothecium pinnatifidum</i>					X			
	<i>Kindbergia praelonga</i>					X			X
	<i>Scleropodium californicum</i>	X		X	X	X	X	X	X
	<i>Scleropodium cespitosum</i>				X	X			X
	<i>Scleropodium julaceum</i>			X	X	X			X
	<i>Scleropodium obtusifolium</i>					X			X
	<i>Scleropodium occidentale</i>				X	X			X
	<i>Scleropodium touretii</i>			X	X	X			X
Bryaceae	<i>Bryum argenteum</i>	X		X	X	X	X		X
	<i>Bryum lanatum</i>			X		X			
	<i>Gemmabryum barnesii</i>			X					
	<i>Gemmabryum caespiticium</i>								X
	<i>Gemmabryum dichotomum</i>			X	X				
	<i>Gemmabryum gemmiferum</i>	X		X	X	X			X
	<i>Gemmabryum gemmilucens</i>			X	X				
	<i>Gemmabryum kunzei</i>	X		X	X	X			X
	<i>Gemmabryum tenuisetum</i>					X			
	<i>Gemmabryum radiculosum</i>			X					
	<i>Gemmabryum violaceum</i>	X		X	X	X			X
	<i>Gemmabryum valparaisense</i>	X		X		X			
	<i>Gemmabryum sp.</i>								X
	<i>Imbriobryum gemmiparum</i>					X			
	<i>Imbriobryum muehlenbeckii</i>					X			X
	<i>Plagiobryoides sp.</i>			X					
	<i>Ptychostomum creberrimum</i>			X					
	<i>Rosulabryum canariense</i>			X					
	<i>Rosulabryum capillare</i>			X		X	X		X
	<i>Rosulabryum erythroloma</i>			X					
	<i>Rosulabryum gemmascens</i>	X		X		X			
	<i>Rosulabryum torquescens</i>			X		X	X		X

TABLE 1. CONTINUED.

Family	Taxon	Ana	SBa	SCa	SCI	SCz	SMi	SNi	SRo
Cryphaeaceae	<i>Dendroalsia abietina</i>				X	X			
Dicranaceae	<i>Campylopus introflexus</i>					X			
	<i>Dicranella varia</i>			X					X
	<i>Dicranoweisia cirrata</i>					X			
Ditrichaceae	<i>Ceratodon purpureus</i>			X	X	X	X	X	X
	<i>Pleuridium acuminatum</i>			X		X			X
	<i>Pleuridium subulatum</i>			X	X	X			X
Ephemeraceae	<i>Ephemerum serratum</i>			X					
Encalyptaceae	<i>Encalypta vulgaris</i>			X					
Fabroniaceae	<i>Fabronia pusilla</i>			X		X			
Fissidentaceae	<i>Fissidens crispus</i>			X	X	X			X
	<i>Fissidens curvatus</i>			X		X			
	<i>Fissidens sublimbatus</i>	X		X	X	X			X
Funariaceae	<i>Entosthodon attenuatus</i>								X
	<i>Entosthodon bolanderi</i>	X		X	X	X		X	X
	<i>Funaria hygrometrica</i>			X		X	X		X
	<i>Funaria muhlenbergii</i>	X		X	X	X			X
Grimmiaceae	<i>Grimmia laevigata</i>	X		X	X	X			X
	<i>Grimmia lisae</i>	X		X	X	X			X
	<i>Grimmia pulvinata</i>			X	X	X			X
	<i>Grimmia trichophylla</i>	X		X	X	X			X
Lembophyllaceae	<i>Bestia longipes</i>	X		X	X	X			X
	<i>Isothecium cristatum</i>			X	X	X			X
	<i>Isothecium stoloniferum</i>					X			X
Leptodontaceae	<i>Alsia californica</i>	X		X	X	X			X
Leskeaceae	<i>Claopodium</i>			X		X			X
	<i>whippleanum</i>								
Leucodontaceae	<i>Antitrichia californica</i>			X		X			X
	<i>Nogopterium gracile</i>	X		X	X	X			X
Meesiaceae	<i>Leptobryum pyriforme</i>			X		X			
Mniaceae	<i>Epipterygium tozeri</i>			X		X			X
	<i>Pohlia longibracteata</i>					X			
	<i>Pohlia nutans</i>					X			
	<i>Pohlia wahlenbergii</i>					X			X
Neckeraceae	<i>Bryolawtonia</i>	+				X			
	<i>vancouveriensis</i>								
	<i>Neckera douglasii</i>					X			
	<i>Porotrichum bigelovii</i>					X			X
Orthotrichaceae	<i>Orthotrichum bolanderi</i>			X					
	<i>Orthotrichum coulteri</i>		+	X		X			X
	<i>Orthotrichum</i>			X					X
	<i>cucullatum</i>								
	<i>Orthotrichum</i>				X				
	<i>diaphanum</i>								
	<i>Orthotrichum</i>	X		X		X			X
	<i>franciscanum</i>								
	<i>Orthotrichum lyellii</i>			X					
	<i>Orthotrichum norrisii</i>			X					
	<i>Orthotrichum papillosum</i>			X	X	X	X		X
Polytrichaceae	<i>Polytrichum juniperinum</i>			X		X			X
Pottiaceae	<i>Acaulon triquetrum</i>					X			
	<i>Aloina aloides</i> var.			X		X	X		X
	<i>ambigua</i>								
	<i>Aloina bifrons</i>			X	X	X	X		
	<i>Barbula convoluta</i>			+					X
	<i>Crossidium</i>							X	
	<i>crassinervium</i>								
	<i>Crumia latifolia</i>					X			
	<i>Didymodon australasiae</i>			X	X	X	X	X	X
	<i>Didymodon</i>	X		X	X	X	X	X	X
	<i>brachyphyllus</i>								
	<i>Didymodon rigidulus</i>		X	X	X	X	X		
	<i>Didymodon tophaceus</i>			X	X	X	X	X	X

TABLE 1. CONTINUED.

Family	Taxon	Ana	SBa	SCa	SCl	SCz	SMi	SNi	SRo
	<i>Didymodon vinealis</i>	X	X	X	X	X	X	X	X
	<i>Eucladium verticillatum</i>			X		X		X	
	<i>Gymnostomum aeruginosum</i>			X					
	<i>Gymnostomum calcareum</i>			X		X			
	<i>Hennediella stanfordensis</i>			X		X			
	<i>Microbryum davallianum</i>			X	X		X		
	<i>Microbryum starckeanum</i>			X	X				
	<i>Pseudocrossidium crinitum</i>			X		X			X
	<i>Pseudocrossidium obtusulum</i>			X					
	<i>Pterygoneurum ovatum</i>					X			
	<i>Stegonia hyalinotricha</i>			X	X	X	X		
	<i>Syntrichia bartramii</i>			X	X				X
	<i>Syntrichia laevipila</i>			X		X			
	<i>Syntrichia papillosa</i>			X	X	X			
	<i>Syntrichia princeps</i>	X		X	X	X			X
	<i>Syntrichia ruralis</i>		X	X	X	X			X
	<i>Timmiella anomala</i>			X	X	X			X
	<i>Timmiella crassinervis</i>			X		X			X
	<i>Tortula acaulon</i>			X	X	X			
	<i>Tortula amplexa</i>			X					
	<i>Tortula atrovirens</i>	X		X	X	X			X
	<i>Tortula bolanderi</i>			X					
	<i>Tortula brevipes</i>	X		X	X	X	X	X	X
	<i>Tortula californica</i>	X		X	X	X			X
	<i>Tortula guepinii</i>			X	X	X	X		
	<i>Tortula obtusifolia</i>			X		X			
	<i>Tortula protobryoides</i>	X		X	X				
	<i>Weissia controversa</i>	X		X	X	X			X
	<i>Weissia ligulifolia</i>			X					
HORNWORTS									
	Anthocerotaceae <i>Anthoceros fusiformis</i>			X					X
	Notothyladaceae <i>Phaeoceros carolinianus</i>					X			
	<i>Phaeoceros pearsonii</i>			X	X	X			
LIVERWORTS									
	Aneuraceae <i>Riccardia chamedryfolia</i>					X			
	Aytoniaceae <i>Asterella californica</i>	X		X	X	X			X
	<i>Asterella palmeri</i>			X					
	<i>Cryptomitrium tenerum</i>			X		X			
	Calypogeiaceae <i>Calypogeia azurea</i>					X			
	Cephaloziellaceae <i>Cephaloziella divaricata</i>			X		X			X
	var. <i>divaricata</i>								
	<i>Cephaloziella divaricata</i>					X			
	var. <i>scabra</i>								
	<i>Cephaloziella hampeana</i>			X					
	<i>Cephaloziella stellulifera</i>					X			X
	<i>Cephaloziella turneri</i>			X		X			
	Fossombronaceae <i>Fossombronina longiseta</i>			X	X	X			X
	<i>Fossombronina pusilla</i>			X	X				
	Frullaniaceae <i>Frullania bolanderi</i>	X		X		X			X
	<i>Frullania californica</i>								X
	<i>Frullania catalinae</i>	X		X	X	X			X
	<i>Frullania nisquallensis</i>								X
	Geocalycaceae <i>Lophocolea bidentata</i>					X			
	Gymnomitriaceae <i>Marsupella bolanderi</i>			X		X			X
	Lunulariaceae <i>Lunularia cruciata</i>			+					
	Marchantiaceae <i>Marchantia polymorpha</i>					X			

TABLE 1. CONTINUED.

Family	Taxon	Ana	SBa	SCa	SCI	SCz	SMi	SNi	SRo
Porellaceae	<i>Porella bolanderi</i>			X	X	X			X
Radulaceae	<i>Radula bolanderi</i>					X			
	<i>Radula complanata</i>					X			X
Ricciaceae	<i>Riccia californica</i>					X			
	<i>Riccia campbelliana</i>			X					
	<i>Riccia cavernosa</i>			X					
	<i>Riccia glauca</i>								X
	<i>Riccia nigrella</i>	X		X	X	X			X
	<i>Riccia sorocarpa</i>			X	X	X			
	<i>Riccia trichocarpa</i>			X	X	X			
Sphaerocarpaceae	<i>Sphaerocarpos texanus</i>			X		X			X
Targioniaceae	<i>Targionia hypophylla</i>	X		X	X	X	X		X
Totals	All islands: 158	33	5	118	62	116	20	10	80

endemics *Lyonothamnus floribundus* A. Gray, *Prunus ilicifolia* subsp. *lyonii* (Eastw.) P.H. Raven, and *Quercus tomentella* Engelm. on the four largest islands. These vegetation types are restricted to the most mesic areas on the islands and persist only in areas where plants can take advantage of dense marine fog to supplement water inputs. On the mainland, *Pinus muricata* is currently restricted to coastal foggy areas along the coast, primarily in northern and central California but with relict populations as far south as Baja California. A relatively good fossil record indicates that *P. muricata* and other closed-cone conifers were much more widespread until relatively recently (Axelrod 1967a). The understory vascular plant species in island *P. muricata* forests include a number of common northern species that become rare in mainland southern California (e.g., *Gaultheria shallon* Pursh, *Vaccinium ovatum* Pursh). The bryophytes mirror this pattern with a number of species of both mosses and liverworts. Significantly, several of these species are known south of Santa Cruz County only from *P. muricata* forests, for example *Lophocolea bidentata* (L.) Dumort. (southernmost mainland population in Bishop Pines at Coon Creek, San Luis Obispo Co.), *Campylopus introflexus* (Hedw.) Brid. (southernmost mainland population in Bishop Pine Forest in the Del Monte Forest, Monterey Co.), and *Neckera douglasii* Hook. (southernmost mainland population in Bishop Pines near Point Conception, Santa Barbara Co.). Other species with a generally more northern mainland distribution include the mosses *Alsia californica* (Hook. & Arn.) Sull., *Bryolawtonia vancouveriensis* (Kindb.) D.H. Norris & Enroth, *Dendroalsia abietina* (Hook.) E. Britton ex Broth. *Isothecium stoloniferum* Brid., and the liverworts *Calypogeia azurea* Stotler & Crotz, *Cryptomitrium tenerum* (Hook.) Austin ex Underw., *Frullania californica* (Austin ex Underw.) A. Evans, *F. nisquallensis* Sull., *Radula complanata* (L.) Dumort., and *R. bolanderi* Gottsche ex Steph.

Although there is no direct evidence that these bryophyte distributions are relictual, the fossil evidence of their woody associates (Axelrod 1967a) strongly suggests that these species once had more extensive southern populations and are now relictual. This floristic link with the north also explains much of the difference between the flora of the islands and the flora of the adjacent Sierra Madre Mountains (Sagar 2007), which have no Bishop Pine forest.

In addition to its ties to the north, the vascular flora of the islands is also strongly linked to the coastal mesas of Baja California. This association is characterized by species of the succulent scrub community dominated by *Opuntia*, *Cylindropuntia*, *Bergerocactus* and *Artemisia* that is particularly well developed on San Clemente Island, but associated vascular species can be found throughout the islands. It remains unclear whether bryophytes also mirror this pattern. The bryophyte flora of the Baja coast is not well documented, nor is the coastal flora of mainland southern California. Compounding the difficulty is the high proportion of ephemeral and taxonomically difficult species in the Pottiaceae and Bryaceae in the region. The presence of a few xerophytic taxa on the islands, for example *Crossidium crassinervium* (De Not.) Jur. and *Pseudocrossidium crinitum* (Schultz) R.H. Zander, suggests ties to the arid mainland regions, however more data need to be collected before any firm conclusions can be drawn about the contribution of the xerophytic mainland flora on the islands.

As with any island flora, some of the intrigue involves species apparently absent from the flora. On the Channel Islands, the most striking of these appear to be due to a lack of appropriate substrate rather than obvious dispersal limitation. Some notable examples include *Orthotrichum rupestre* Schleich. ex Schwägr. and species in *Hedwigia* P. Beauv. and *Schistidium* Bruch & Schimp., all of which are saxicolous and might be excluded due to a lack of suitable substrate. No pattern of

absences among soil dwelling mosses is immediately apparent, and epiphytes (e.g., *Orthotrichum*, *Frullania* Raddi) appear to be strongly represented due to the increased fog on the islands. The islands also have a strong representation of semi-aquatic and rheophytic species. These include *Hygrohypnum bestii* (Renauld & Bryhn) Holz., *Leptodictyum riparium* (Hedw.) Warnst., *Scleropodium obtusifolium* (Mitt.) Kindb., *S. occidentale* B.E. Carter, and as well as the seep species *Crumia latifolia* (Kindb.) W.B. Schofield, *Didymodon tophaceus* (Brid.) Lisa, and *Eucladium verticillatum* (With.) Bruch & Schimp.

Unlike the vascular island flora, endemism is not important in the island bryophyte flora, as no species are endemic to the archipelago. The two undescribed species are both known only from occurrences on the islands, but the bryophyte flora of coastal mainland southern California is poorly enough known that these should only very tentatively be considered island endemics pending further exploration of the mainland. An interesting near-endemic is *Frullania catalinae* A. Evans, which is among the most common epiphytic bryophyte species on the islands but appears to be relatively rare on the mainland, with a few scattered localities along the coast from San Luis Obispo County to San Diego County.

Although the vascular flora and vegetation of the islands are strongly influenced by introduced species, there are few introduced bryophytes, and none of these appear to be ecologically important. Four species are known only from irrigated flowerbeds in Avalon or Middle Ranch on Santa Catalina: *Amblystegium serpens* (Hedw.) Schimp., *Gemmabryum radiculosum* (Brid.) J.R. Spence & H.P. Ramsay, *Leptobryum pyriforme* (Hedw.) Wilson, and *Lunularia cruciata* (L.) Dumort. ex Lindb.. The first three of these are native to coastal California but are known on the islands only from areas with year-round anthropogenic irrigation. Two additional species, *Campylopus introflexus* (Hedw.) Brid. and *Fissidens curvatus* Hornsch., are naturalized. The *Campylopus* Brid. populations are concentrated in the relatively undisturbed Bishop pine forests of Santa Cruz Island with outlying populations in other high-elevation, fog-influenced areas (Carter 2014). *Fissidens curvatus* is known from disturbed areas in the Central Valley on Santa Cruz and from coastal areas (e.g., Ben Weston and Little Harbor) on Santa Catalina. The distribution of *Marchantia polymorpha* L. also suggests recent anthropogenic introduction. It is known only from the mouths of drainages near the sea on the Channel side of Santa Cruz. These are popular boat-in recreational sites, and the absence of the species from higher in the watersheds suggests that the species may be a recent addition to the flora. Two other species, *Hennediella stanfordensis* (Steere) Blockeel and *Sphaerocarpos texanus* Austin, have both

been found exclusively on dirt roads and may be recent introductions as well.

While much work remains to be done on the islands, the general patterns mentioned here suggest that the bryophyte flora has strong potential to inform a more general understanding of the biogeography of coastal California. Because the bryophytes are primarily spore-dispersed, the contrasts (and similarities) in floristic patterns between the bryophyte and vascular floras presents an opportunity to develop a richer understanding of the island biogeography of the Channel Islands, as well as effective conservation strategies for both the islands and the adjacent mainland.

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APPENDIX 1

An annotated checklist of the bryophytes of the Channel Islands. Island abbreviations are as follows: Ana = Anacapa, SBa = Santa Barbara, SCa = Santa Catalina, SCl = San Clemente, SCz = Santa Cruz, SMi = San Miguel, SNi = San Nicolas, SRo = Santa Rosa. Nomenclature follows treatments in the Flora of North America unless otherwise noted. For brevity, a single voucher is provided for each species on each island. Additional records, and exact locality data for the specimens cited here, can be queried using the online database of bryophyte specimens at UC (http://ucjeps.berkeley.edu/bryolab/UC_bryophytes.html) or the Consortium of North American Bryophyte Herbaria (<http://bryophyteportal.org/portal/>). McCleary (1972) and Steere (1954) did not cite vouchers for their reports. Some of these vouchers were relocated and are reported here. Reports for which no voucher could be found have only the citation where the report was made. An asterisk (*) before the species name indicates a new report for the archipelago, and an asterisk before a report for a specific island indicates a first report of the species on that island. Synonyms used in previous literature reports are included for each currently accepted species.

MOSSES

Amblystegiaceae

**Amblystegium serpens* (Hedw.) Schimp.

SCa: Avalon, *Carter* 6853 (UC). Known only from an irrigated flowerbed in Avalon.

Conardia compacta (Hook.) H. Rob.

Reported as *Rhynchostegiella compacta* (Müller Hal.) Loeske by McCleary (1972); as

Amblystegium compactum (Müll. Hal) Grout by Steere (1954). SCa: Reported by Steere (1954); *SCz: Cañada del Puerto, *Carter* 4715 (UC). Known from only a historical record on Santa Catalina and a single recent record on Santa Cruz. Steere's voucher has not been relocated.

**Hygrohypnum bestii* (Renauld & Bryhn) Holz.

SCa: Slopes above White's Landing, *Carter* 5519a (UC); SCz: Along road to Willow's Anchorage, *Carter* 6099 (UC). Rare, known from single specimens in seasonal drainages from both islands. The Santa Catalina specimen consists of only a few stems separated from a collection of *Eucladium verticillatum* (With.) Bruch & Schimp.

**Leptodictyum riparium* (Hedw.) Warnst.

SCz: Cañada del Puerto, *Carter* 5452 (UC). Locally common in Cañada del Puerto.

Bartramiaceae

Anacolia menziesii (Turner) Paris var. *baueri* (Hampe) Paris

Reported by McCleary (1972), Steere (1954); as *Anacolia menziesii* (Turn.) Paris, Sayre (1940). *Ana: *Hoffmann* 21 (SBBG); SCa: Black Jack Mtn., *Carter* 5767 (UC); SCl: Eagle Canyon, *Carter* 4390 (UC); *SCz: Above Dick's

Harbor, *Carter* 6736 (UC); *SRo: Torrey Pines, *Shevock* 20789 (SBBG). Common and widespread throughout the islands, especially in chaparral, woodlands, and on north facing grassy slopes. Different opinions exist with respect to species circumscriptions within *A. menziesii* s.l. Norris and Shevock (2004a, 2004b) recognize *A. baueri* as a separate species from *A. menziesii*, with the sporophyte being necessary for confident identification. Alternatively, other workers including Griffin (2003), include *A. baueri* (Hampe) Paris within the concept of *A. menziesii* and do not recognize named variants within *A. menziesii* s.l. Sporophytes are not common on the islands, but when present, they exhibit the more elongate capsule of *A. menziesii* var. *baueri*.

Bartramia aprica Müll. Hal.

Reported as *Bartramia stricta* Brid. by Sayre (1940), McCleary (1972). SCa: Howland's Landing, *Carter* 7185 (UC). Occasional on Santa Catalina Island, where it is associated with soil crusts. Earlier reports of this species (as *B. stricta*) from Santa Catalina, Santa Rosa, Santa Cruz, Anacapa and San Clemente were based on misidentified specimens of *Anacolia menziesii* var. *baueri*. Several recent collections document the species occurring on Santa Catalina. The name *Bartramia aprica* replaces the incorrectly applied name *B. stricta* (Müller 2014).

Brachytheciaceae

**Brachythecium bolanderi* (Lesq.) A. Jaeger

SCa: Bulrush Canyon, *Carter* 6889 (UC); SCz: Tinker's Cove, *Game* 08/132 (UC). Uncommon on soil in mesic woodlands. Known from several locations around Santa Catalina and from a single collection on Santa Cruz.

Homalothecium arenarium (Lesq.) E. Lawton

Reported by McCleary (1972); as *Camptothecium arenarium* (Lesq.) Jaeg. & Sauerb. by Williams (1923), Sayre (1940), Steere (1954); as *C. alsoides* Kindb. by Steere (1954). Ana: *Hoffmann* 22 (SBBG); SBa: Head of Middle Canyon, *Blakley* 5634 (SBBG); SCa: East end of Isthmus Harbor, *Blakley* 4757 (SBBG); *SCl: Eagle Canyon, *Carter* 4461 (UC); SCz: Prisoner's Harbor, *Blakley* 5289a (SBBG); *SMi: Between Baypoint and Cuyler's Harbor, *Blakley* 4281a (SBBG); *SRo: Cherry Canyon, *Blakley* 3064c (SBBG). This is one of the most common species on the islands in grasslands and coastal scrub. It is not yet documented from San Nicolas, but undoubtedly will be found there with further collecting.

Homalothecium nuttallii (Wilson) A. Jaeger

Reported by Steere (1954), McCleary (1972). SCa: Canyon above Pebbly Beach, *Carter* 6857 (UC); SCl: SHOBA Gate, *Carter* 6633 (UC); *SCz: Mt. Diablo, *Carter* 5977 (UC); *SRo: Upper Water Canyon, *Carter* 6129 (UC). This species on the islands is highly variable in habit, microsite preference, and leaf morphology. On the mainland, it is mostly restricted to tree trunks, but on the islands it is also commonly found on boulders and tree bases. The plants tend to be larger and more robust than typical mainland populations, and the habit of some strongly resembles that of *H. aeneum* (Mitt.) E. Lawton. The recurved basal serrations found on mainland populations grade

from typical to essentially absent on the islands, thus increasing the resemblance to *H. aeneum*, which has serrulate to serrate (but never with recurved serrations) basal margins. Although *H. pinnatifidum* (Sull. & Lesq.) E. Lawton also occurs on the adjacent mainland, the smooth basal margins and greater number of alar cells along the margin prevent confusion of that species with *H. nuttallii* or *H. aeneum*. Because of the morphological confusion, I sequenced ITS for eight specimens (Santa Catalina: *Carter* 4470, 5548, 5755, 7009, 7012; Santa Cruz: *Carter* 4655, 5977; San Clemente *Carter* 6633) representing the range of morphological variation encountered on the islands and compared the sequences to GenBank sequences included in a phylogenetic analysis (Huttunen et al. 2008) that demonstrated the reciprocal monophyly of *H. nuttallii*, *H. pinnatifidum* (as *H. aureum* [Spruce] H. Rob.), and *H. aeneum*. Phylogenetic analyses (results not shown) confirmed unambiguously that all eight of the island accessions are *H. nuttallii*. With this understanding of the broad phenotypic plasticity of *H. nuttallii* on the islands, I have seen no specimens that can serve as vouchers for *H. aeneum* on the islands. Steere (1954) documented the species from Santa Catalina, but I have been unable to locate his voucher. Species boundaries in *Homalothecium* Schimp. have received considerable attention since Steere (1954) and Sayre (1940) published their lists (Lawton 1965, 1971; Hofmann 1998; Norris & Shevock 2004b), and their determinations were made based on species circumscriptions that are much better understood now than they were at that time.

Homalothecium pinnatifidum (Sull. & Lesq.) E. Lawton
Reported as *Camptothecium pinnatifidum* (Sull. & Lesq.) Jaeg. & Sauerb. by Steere (1954). *SCz: Cañada del Puerto, *Carter* 4628 (UC). Known only from Cañada del Puerto on Santa Cruz. Steere's report of *Camptothecium pinnatifidum* from Santa Catalina is based on a misidentified specimen (UBC-B225072) of *Scleropodium californicum*. See notes under *H. nuttallii* for further discussion.

Kindbergia praelonga (Hedw.) Ochyra
Reported as *Eurhynchium praelongum* var. *stokesii* (Turner) Habk. by McCleary (1972). *SCz: Christy Pines, *Carter* 5398 (UC); **SRo**: Upper Windmill Canyon, *Shevock* 20889 (SBBG). Uncommon, restricted to very mesic areas at upper elevations and in deep canyons along the Channel side of the islands.

Scleropodium californicum (Lesq.) Kindb.
Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **Ana**: West Island, *Blakley* 4375 (SBBG); **SCa**: Cherry Cove, *Carter* 5914; **SCI**: Between Eel Point and Seal Cove, *Blakley* 5245 (SBBG); **SCz**: Prisoner's Harbor, *Blakley* 5291a (SBBG); **SMi**: Cuyler Harbor, *Carter* 6301 (UC); **SNi**: Canyon southeast of sheep dock, *Blakley* 4146 (SBBG); **SRo**: Cañada Lobos, *Shevock* 20839 (SBBG). Occasional to common throughout the islands. Known from all islands except Santa Barbara.

Scleropodium cespitosum (Müll. Hal.) L.F. Koch
Reported by McCleary (1972); as *Scleropodium caespitosum* (Wils.) B.S.G. by Steere (1954). *SCI: Eastern escarpment, *Carter* 6609 (UC); *SCz: North Slope of Mt. Diablo, *Carter* 5979 (UC); *SRo: Black Mountain, *Carter* 6218 (UC). Uncommon, restricted

to mesic areas at higher elevations. Steere's report of this species from Santa Catalina was based on a misidentified specimen (UBC-B225073) of *Scleropodium touretii*. Another collection labeled *S. cespitosum* from Santa Catalina, *Fosberg* 439 (UC, NY) is *S. californicum*.

Scleropodium julaceum E. Lawton
Reported as *Scleropodium apocladum* (Mitt.) Grout by McCleary (1972). **Ana**: Villaseñor s.n., Feb 2011 (UC); *SCa: Gallagher's Canyon, *Carter* 5781 (UC); *SCI: Eagle Canyon, *Carter* 4391 (UC); **SCz**: Cañada del Puerto, *Carter* 4614 (UC); **SRo**: Black Mountain, *Carter* 6223 (UC). Locally common on mesic slopes and in canyons, especially on the Channel side of the islands.

****Scleropodium obtusifolium*** (Mitt.) Kindb.
SCz: Hooker Canyon, *Carter* 4721 (UC); **SRo**: Upper Cherry Canyon, *Shevock* 20912 (SBBG). Occasional on rocks in shaded seasonal streams.

****Scleropodium occidentale*** B.E. Carter
SCI: Mosquito Canyon, *Villaseñor* s.n., 26 Mar 2011 (UC); **SCz**: Above Dick's Harbor, *Carter* 6744 (UC); **SRo**: Upper Cherry Canyon, *Carter* 6237 (UC). Occasional on rocks in shaded seasonal streams.

Scleropodium touretii (Brid.) L.F. Koch
Reported by McCleary (1972); as *S. illecebrum* (Schwagr.) BSG by Williams (1923), Sayre (1940), Steere (1954); as *Scleropodium colpophyllum* (Sull.) Grout by Steere (1954). **SCa**: Black Jack Mountain, *Carter* 4576 (UC); *SCI: Eastern escarpment, *Carter* 6608 (UC); *SCz: Hoffmann 27 (SBBG); *SRo: Torrey Pines, *Carter* 6255 (UC). Common on soil in most habitats throughout the larger islands.

Bryaceae

****Bryum argenteum*** Hedw.
Ana: West Anacapa, *Villaseñor* s.n., Feb 2011 (UC); **SCa**: Middle Ranch, *Carter* 5594 (UC); **SCI**: Above Eagle Canyon, *Carter* 4428 (UC); **SCz**: Lagunitas Secas Rd., *Carter* 5413 (UC); **SMi**: Nidever Canyon, *Carter* 6279 (UC); **SRo**: Water Canyon, *Carter* 6150 (UC). Occasional to common throughout the islands in dry, sunny areas.

Bryum lanatum Hedw.
Reported as *Bryum argenteum* var. *lanatum* (Brid.) BSG, Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Golf Links Canyon (near Avalon), *Millsbaugh* 4644 (NY); *SCz: Upper Christy Valley, *Carter* 4703 (UC). Steere (1954) found the species to be uncommon at White's Landing, but that population and the voucher have not been relocated. On Santa Cruz, it is known from several collections in Christy Valley.

****Gemmabryum barnesii*** (J.B. Wood ex Schimp.) J.R. Spence
SCa: 4th of July Cove, *Carter* 4518 (UC). Known from several collections in dry areas on Santa Catalina.

****Gemmabryum caespitium*** (Hedw.) J.R. Spence
SRo: East flank of Black Mtn., *Carter* 6225a (det. Spence) (UC). Known from a single specimen mixed with a more robust collection of *G. kunzei*.

Gemmabryum dichotomum (Hedw.) J.R. Spence & H.P. Ramsay

Reported as *Bryum bicolor* Dicks. by Steere (1954), McCleary (1972); as *B. californicum* Sull. by Williams (1923), Sayre (1940). **SCa**: Avalon Canyon, Knopf 326 (NY) ***SCI**: Horton Canyon, Carter 4355 (UC). Known from several locations in dry, grassy areas on San Clemente. Populations on Santa Catalina are known only from historic specimens reported by Williams (1923) and Steere (1954).

**Gemmabryum gemmiferum* (R. Wilczek & Demaret) J. R. Spence

Ana: East Anacapa near campground, Carter 6119 (UC); **SCa**: Middle Ranch, Carter 5593 (UC); **SCI**: Horton Canyon, Carter 4333 (UC); **SCz**: Ridgeline above Central Valley, Carter 4642b (UC); **SRO**: Water Canyon, Carter 6138 (UC). Probably the most common species of *Gemmabryum* on the islands.

**Gemmabryum gemmilucens* (R. Wilczek & Demaret) J. R. Spence

SCa: Salta Verde Ridge Road, Carter 7125 (UC); **SCI**: northwest of SHOBA gate, Carter 6594 (UC). Known from several collections in dry areas on Santa Catalina and San Clemente.

**Gemmabryum kunzei* (Horns.) J.R. Spence

Ana: West Anacapa, Villaseñor s.n., Feb 2011 (UC); **SCa**: Twin Rocks, Carter 7160 (UC); **SCI**: Mail Point, west side of island, Carter 6548 (det. Spence) (UC); **SCz**: Southern rim of Central Valley, Carter 5319 (det. Spence) (UC); **SRO**: East flank of Black Mtn., Carter 6225 (det. Spence) (UC). Occasional, mostly in foggy areas at higher elevations or near the coast on the Channel side.

**Gemmabryum tenuisetum* (Limpr.) J.R. Spence & H.P. Ramsay

SCz: *Lyonothamnus* stand along ridge road, Carter 6652 (det. Spence) (UC). Known from a single collection.

**Gemmabryum radiculosum* (Brid.) J.R. Spence & H.P. Ramsay

SCa: Flowerbed in Avalon, Carter 6852 (UC). Known from a single collection in an irrigated flowerbed in Avalon.

**Gemmabryum violaceum* (Crundw. & Nyholm) J.R. Spence

Ana: West Anacapa, Villaseñor s.n., Feb 2011 (UC); **SCa**: Salta Verde Cutoff Rd., Carter 7115 (UC); **SCI**: Horton Canyon, Carter 4360 (det. Spence) (UC); **SCz**: Sierra Blanca Ridge, Carter 6696 (UC); **SRO**: Cherry Canyon, Carter 6231a (UC). Occasional to common in dry, grassy areas.

**Gemmabryum valparaisense* (Thér.) J.R. Spence

Ana: West Anacapa, Villaseñor s.n., Feb 2011 (det. Spence) (UC); **SCa**: Orizaba Mtn., Carter 4568 (det. Spence) (UC); **SCz**: Central Valley, Carter 4646 (UC). Occasional throughout the islands.

**Gemmabryum* sp.

SRO: Torrey Pines, Shevock 20776 (CAS). According to J. Spence (personal communication 2014), this is a putative undescribed species that is provisionally considered endemic to Santa Rosa Island pending future collecting on the islands and the adjacent mainland.

**Imbribryum gemmiparum* (De Not.) J.R. Spence

SCz: Hooker Canyon, Carter 6774 (det. Spence) (UC). Known from a single collection in a seasonal drainage.

**Imbribryum muehlenbeckii* (Bruch & Schimp.) N. Pedersen

SCz: Slopes above Dick's Harbor, Carter 6751 (UC); **SRO**: Cherry Canyon, Carter 6234 (det. Spence) (UC). Known from several collections in seeps and springs on Santa Cruz, and a single collection from Santa Rosa.

**Plagiobryoides* sp.

SCa: Slopes above White's Landing, Carter 5540a (det. Spence) (UC). According to J. Spence (personal communication 2012), this sterile specimen most likely represents an undescribed species. It is known only from the collection cited above and is provisionally considered to be endemic to Santa Catalina pending more collections.

Ptychostomum creberrimum (Taylor) J.R. Spence & H.P. Ramsay

Reported as *Bryum cuspidatum* (BSG) Schimp. by Steere (1954); as *B. intermedium*, by Williams (1923); as *B. creberrimum* Taylor by McCleary (1972). **SCa**: Reported by Steere (1954) from White's Landing. Steere (1954) noted "Common on soil, from shaded moist slopes of deep canyons to open insolated valley bottoms; with sporophytes." Williams (1923) reported this species from Pebble Beach Canyon based on Millspaugh 4694 (NY), but that specimen was annotated by Koch (x. 1950) as *Bryum capillare* (= *Rosulabryum capillare*).

Rosulabryum canariense (Brid.) Ochyra

Reported as *Bryum canariense* Brid. by Steere (1954), McCleary (1972). **SCa**: Black Jack Mountain, Carter 5753 (UC). Occasional at high elevations and in mesic canyons on Santa Catalina.

Rosulabryum capillare (Hedw.) J.R. Spence

Reported as *Bryum capillare* Hedw. by Steere (1954), McCleary (1972); as *B. obconicum* Sull. by Kingman (1912), Williams (1923), Sayre (1940). **SCa**: Salta Verde Cutoff Rd., Carter 6928 (UC); ***SCz**: Sierra Blanca Ridge, Carter 6669 (UC); ***SMi**: Nidever Canyon, Carter 6281 (UC); ***SRO**: Water Canyon, Carter 6156 (UC). Occasional in mesic areas.

**Rosulabryum erythroloma* (Kindb.) J.R. Spence

SCa: Italian gardens, Carter 5839 (UC). Known from two collections from slopes on the Channel side of Santa Catalina.

**Rosulabryum gemmascens* (Kindb.) J.R. Spence

Ana: West Anacapa, Villaseñor s.n., Feb 2011 (UC); **SCa**: Twin Rocks, Carter 7165 (UC) **SCz**: Between Prisoner's Harbor and Pelican Bay, Carter 6032 (UC). Occasional along the Channel slope of Santa Catalina, and single collections from Anacapa and Santa Cruz.

Rosulabryum torquescens (Bruch & Schimp.) J.R. Spence

Reported as *Bryum torquescens* by Williams (1923), Sayre (1940). **SCa**: Two Harbors, Carter 7170 (UC); ***SCz**: Pelican Bay, Carter 6075 (UC); ***SMi**: Cabrillo monument, Carter 6272 (UC); ***SRO**: Torrey Pines, Carter 6261 (UC). Common in mesic habitats. Steere (1954) considered this to be conspecific with *Bryum capillare* (= *Rosulabryum capillare*).

Cryphaeaceae

**Dendroalsia abietina* (Hook.) E. Britton ex Broth.
SCI: Ridgeline near SHOBA gate, *Carter 6626* (UC);
SCz: Above Lady's Harbor, *Fosberg 416* (UC). Rare,
 on oaks. The population on San Clemente is at the top
 of the eastern escarpment, while the historical
 collection on Santa Cruz was probably at a low
 elevation (the population could not be relocated).
 Remarkably, this large and moisture-loving species has
 also been documented from the coniferous forests of
 Guadalupe Island off the coast of Baja México (Koch
 and Crum 1950).

Dicranaceae

Campylopus introflexus (Hedw.) Brid.
 Reported by Norris & Shevock (2004), Carter (2014).
SCz: Christy Pines, *Carter 5334* (UC). This species is
 presumably introduced from the southern hemisphere
 (Carter 2014). A fairly common species along the
 northern coast of California, it is rare in southern
 California and this population is the only one known
 from south of the Monterrey Peninsula. It has
 scattered, depauperate populations in Christy Pines and
 on the upper north slope of Mt. Diablo. A very large
 population with contiguous areas exceeding 20 m² was
 found along Sierra Blanca Ridge.

Dicranella varia (Hedw.) Schimp.
 Reported by Sayre (1940), McCleary (1972); as
Anisothecium varium (Hedw.) Mitt. by Steere (1954); as
Dicranella rubra (Huds.) Kindb. by Williams (1923).
SCa: Italian Gardens, *Carter 5837* (UC); ***SRo:** Below
 north slope of Black Mountain, *Shevock 20902* (CAS).
 Occasional in mesic, open areas on Santa Catalina.
 Known from a single collection on Santa Rosa.

**Dicranoweisia cirrata* (Hedw.) Lindb. ex Milde
SCz: North slope of Mt. Diablo, *Carter 5983* (UC).
 Known from a single collection on a charred log.

Ditrichaceae

Ceratodon purpureus (Hedw.) Brid.
 Reported by Sayre (1940), Steere (1954), McCleary
 (1972). **SCa:** Salta Verde Cutoff Road, *Carter 7107*
 (UC); **SCI:** *Elmore s.n.*, 24 Nov 1939 (UC); ***SCz:**
 Sierra Blanca Ridge, *Carter 6687* (UC); **SMi:** Reported
 by McCleary (1972); **SNi:** Reported by McCleary
 (1972); ***SRo:** Soledad Mountain, *Shevock 20749*
 (CAS). Occasional, mostly in mesic areas along
 ridgelines and in canyon mouths.

**Pleuroidium acuminatum* Lindb.
SCa: Fern Canyon, *Carter 5464* (UC); **SCz:** Christy
 Valley, *Carter 4702* (UC); **SRo:** Cañada Tecelote,
Shevock 20759 (CAS). Common on bare soils.
 Probably undercollected due to its small size and
 present throughout the islands.

**Pleuroidium subulatum* (Hedw.) Rabenh.
SCa: Little Geiger Canyon, *Carter 4529* (UC); **SCI:**
 Twin Dams, *Carter 5711* (UC); **SCz:** Sierra Blanca
 Ridge, *Carter 6697* (UC); **SRo:** Becher's Bay, *Carter*
6267 (UC). Common on bare soils. Probably

undercollected due to its small size and present
 throughout the islands.

Ephemeraceae

**Ephemerum serratum* (Schreb. ex Hedw.) Hampe
SCa: Slopes above White's Landing, *Carter 5925a* (UC).
 Known from a single collection.

Encalyptaceae

Encalypta vulgaris Hedw.
 Reported as *Encalypta vulgaris* var. *mutica* Brid. by
 Steere (1954), McCleary (1972). **SCa:** Italian Gardens,
Carter 5837a (UC). Uncommon along the Channel side
 of the island. No sporophytes observed.

Fabroniaceae

**Fabronia pusilla* Raddi
SCa: Upper slopes above White's Landing, *Carter 5537*
 (UC); **SCz:** Mt. Diablo, *Carter 5991* (UC). Uncommon,
 on oak trees and large, shaded rock faces.

Fissidentaceae

Fissidens crispus Mont.
 Reported as *Fissidens limbatus* Sull. by Williams (1923),
 Sayre (1940), Steere (1954), McCleary (1972). **SCa:**
 Little Geiger Canyon, *Carter 4541* (UC); ***SCI:** Top of
 Horton Canyon, *Carter 4334* (UC); ***SCz:** Between
 Prisoner's Harbor and Pelican Bay, *Carter 6028* (UC);
***SRo:** Lower Windmill Canyon, *Shevock 20770* (det.
 Pursell) (SBBG). Widespread and common, though
 apparently more restricted to mesic habitats than *F.*
sublimatus.

**Fissidens curvatus* Hornsch.
SCa: Ben Weston Beach, *Carter 8386* (UC); **SCz:** Near
 UC Field Station, *Carter 4650* (UC). This species,
 understood to be introduced in California (Pursell
 2006), was collected several times on disturbed soils in
 the vicinity of the UC Field Station on Santa Cruz and
 in coastal areas from Ben Weston to Little Harbor on
 Santa Catalina.

**Fissidens sublimatus* Grout
Ana: West Anacapa, *Villaseñor s.n.* (UC); **SCa:** Cherry
 Valley, *Carter 5917* (UC); **SCI:** Top of Eagle Canyon,
Carter 4434 (UC); **SCz:** Road from Central Valley to
 Ridge Road, *Carter 5947* (UC); **SRo:** Box Canyon,
Shevock 20795 (det. Pursell) (SBBG). Widespread and
 common throughout the islands.

Funariaceae

**Entosthodon attenuatus* (Dicks.) Bryhn
SRo: Cherry Canyon, *Norris 102123* (UC). Known from
 a single collection.

Entosthodon bolanderi Lesq.
 Reported by McCleary (1972); as *Funaria bolanderi*
 (Lesq.) Holz. by Bartram (1933), Sayre (1940). ***Ana:**
 East Islet near Ranger Station, *Carter 6124* (UC); **SCa:**
 Ben Weston Beach, *Carter 8394* (UC); **SCI:** Ridge
 above Twin Dams Canyon, *Carter 5746* (UC); ***SCz:**
 Mouth of Los Sauces Creek, *Carter 6708* (UC); **SNi:**
 No specific locality, *J.T. Howell s.n.*, 13 Mar 1932

(CAS); **SRo**: Vail Ranch House, *Blakley 3065* (SBBG). Occasional to common in dry areas, including areas subjected to salt spray.

***Funaria hygrometrica* Hedw.**

Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Tributary to Fern Canyon, *Carter 5471* (UC); ***SCz**: Ridge Road, *Carter 5265* (UC); ***SMi**: Limonton Cave, *Fosberg F403* (NY); ***SRo**: Box Canyon, *Shevock 20793* (CAS, SBBG). Occasional on disturbed soil throughout the islands.

***Funaria muhlenbergii* Turner**

Reported by Sayre (1940), Steere (1954), McCleary (1972); as *F. mediterranea* Lindb. by Williams (1923). ***Ana**: Villaseñor s.n., Feb 2011 (UC); **SCa**: Little Geiger Canyon, *Carter 4531* (UC); ***SCI**: Eagle Canyon, *Carter 4466* (UC); ***SCz**: Prisoner's Harbor, *Carter 6107* (UC); ***SRo**: Junction of Cherry and Windmill Canyons, *Blakley 3064d* (SBBG). Occasional throughout the islands.

Grimmiaceae

***Grimmia laevigata* (Brid.) Brid.**

Reported by Sayre (1940), McCleary (1972). ***Ana**: Villaseñor s.n., Feb 2011 (UC); ***SCa**: Black Jack Campground, *Carter 5771* (UC); **SCI**: Knob Canyon, *Carter 5704* (UC); ***SCz**: Mt. Diablo, *Carter 5958* (UC); ***SRo**: Box Canyon, *Shevock 20805* (det. Muñoz) (SBBG). Occasional to locally abundant on sunny boulders.

****Grimmia lisae* De Not.**

Ana: West Anacapa, Villaseñor s.n., Feb 2011 (UC); **SCa**: Black Jack Mtn., *Carter 5756* (UC); **SCI**: Eagle Canyon, *Carter 4449* (UC); **SCz**: Above Lady's Harbor, *Carter 6019* (UC); **SRo**: Upper tributary to Water Canyon, *Shevock 20823* (det. Muñoz) (UC). Occasional to common on rock outcrops, especially in shaded areas. As with populations on the adjacent mainland, *G. lisae* and *G. trichophylla* intergrade and there are differences in opinion with respect to their circumscriptions (personal communication R. Hastings and D. Toren, 2013). On the islands, I have found the leaf curvature (arcuate in *G. lisae* vs. S-shaped in *G. trichophylla*) to be more consistent than leaf areolation. Island populations of *G. trichophylla* often tend to be lighter green and slightly smaller than *G. lisae*.

***Grimmia pulvinata* (Hedw.) Sm.**

Reported by Steere (1954), McCleary (1972). **SCa**: Lower Middle Canyon, *Carter 7271* (det. Hastings) (UC); ***SCz**: Sierra Blanca Ridge, *Carter 6674* (UC). Only collected once on Santa Catalina for this study. Steere (1954) reported a sterile, reduced form of the species from White's Landing, but the population was not relocated.

***Grimmia trichophylla* Grev.**

Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972); as *G. decipiens* (Schultz) Lindb. by Sayre (1940), McCleary (1972). ***Ana**: Villaseñor s.n., Feb 2011 (UC); **SCa**: Middle Ranch, *Carter 4474* (UC); **SCI**: Twin Dams Canyon, *Carter 5724* (UC); ***SCz**: Christy Pines, *Carter 5394* (UC); **SRo**: Upper Cherry Canyon, *Shevock 20907* (det. Muñoz) (SBBG). Occasional to common on rock outcrops. See notes under *G. lisae*.

Lembophyllaceae

***Bestia longipes* (Sull. & Lesq.) Broth.**

Reported as *Bestia brevipes* (Sull. & Lesq.) Broth., by Steere (1954), McCleary (1972). ***Ana**: West Island, in oak grove canyon, *Blakley 5023* (SBBG); **SCa**: Middle Ranch Road west of Middle Ranch, *Carter 5487* (UC); ***SCI**: Eagle Canyon, *Carter 4397* (UC); ***SCz**: Coches Prietos Canyon, *Blakley 3371* (SBBG); ***SRo**: Upper tributary to Water Canyon, *Shevock 20817* (SBBG). Restricted to rocks in shaded, mesic canyons, especially at low elevations. Often abundant within these habitats

***Isothecium cristatum* (Hampe) H. Rob.**

Reported by McCleary (1972); as *Bestia breweriana* (Lesq.) Grout by Steere (1954). **SCa**: Salta Verde Cutoff, *Carter 7116* (UC); ***SCI**: Central Ridgeline, *Carter 6616* (UC); ***SCz**: Christy Pines, *Carter 4658* (UC); ***SRo**: Upper Cherry Canyon, *Shevock 20906* (SBBG). Limited to very mesic slopes and canyons, but often locally abundant.

****Isothecium stoloniferum* Brid.**

SCz: Christy Pines, *Carter 4675* (UC); **SRo**: Burma Road, *Carter 6184* (UC). Species circumscriptions in *Isothecium* are problematic (Ryall et al. 2005), with problems in California associated with delimitation of *I. stoloniferum*, *I. spiculiferum* and *I. myosuroides*. This study follows Schofield (2014) in a broad interpretation of *I. stoloniferum*. Several herbarium specimens identified as other species can be referred to *I. stoloniferum* s.l., including reports of *Platydictya jungermannioides* (Brid.) Crum, *Norris 102063* (UC), and *Eurhynchium stokesii* (Smith) Schimp., *Blakley 3049* and *3049c* (CAS). *Isothecium stoloniferum* s.l. forms extensive mats in Christy Pines on Santa Cruz Island and is locally abundant beneath the canopies of old relict *Quercus tomentella* individuals along Burma Road on Santa Rosa. These are clearly relict populations limited to the foggiest localities on the islands. On the mainland, this species (or species complex) is not currently known south of Monterey County.

Leptodontaceae

***Alsia californica* (Hook. & Arn.) Sull.**

Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). ***Ana**: West Island, *Blakley 4375b* (SBBG); **SCa**: Between Black Jack Mtn. and the airport, *Carter 5935* (UC); ***SCI**: Just below central ridgeline, *Munz 6719* (UC); **SCz**: South of Stanton Ranch Headquarters, *Blakley 4004e* (SBBG); **SRo**: Upper tributary to Water Canyon, *Shevock 20814* (SBBG). Restricted to oak woodlands (*Q. agrifolia*, *Q. tomentella*, *Q. chrysolepis*) and consequently rare on the southern islands. Primarily found on oaks near ridgelines or in narrow canyons near sea level.

Leskeaceae

***Claopodium whippleanum* (Sull.) Renauld & Cardot**

Reported by Sayre (1940), Steere (1954), McCleary (1972); as *C. whippleanum* var. *leuconeuron* (Sull. & Lesq.) Grout by McCleary (1972); as *C. leuconeuron* (Sull. & Lesq.) Ren. & Card. by Williams (1923). **SCa**: Two Harbors Road, *Carter 4512* (UC); ***SCz**: Cañada del Puerto, *Carter 4588* (UC); ***SRo**: Windmill

Canyon, *Shevock 20904* (SBBG). Occasional on bare soil in mesic woodlands.

Leucodontaceae

Antitrichia californica Sull. ex Lesq.

Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Between Black Jack Campground and Mt. Orizaba, *Shevock 4034* (UC); ***SCI**: Ridgeline near SHOBA gate, *Carter 6639* (UC); ***SCz**: North-facing slope below Mt. Diablo, *Carter 5986* (UC). Rare. Known from two or fewer occurrences on each of the islands listed. On oak trunks or boulders in mesic oak woodlands.

Nogopterium gracile (Hedw.) Crosby & W.R. Buck

Reported as *Pterogonium gracile* (Hedw.) Sm. by Steere (1954), McCleary (1972). ***Ana**: *Villaseñor s.n., Feb 2011* (UC); **SCa**: Middle Ranch, *Carter 5497* (UC); ***SCI**: Eagle Canyon, *Carter 4396* (UC); **SCz**: Mt. Diablo, *Weber B-90027* (SBBG); ***SRo**: Torrey Pines, *Shevock 20783* (SBBG). Restricted to very mesic slopes and deep canyons along the Channel side, where it is locally abundant.

Meesiaceae

Leptobryum pyriforme (Hedw.) Wilson

SCa: Middle Ranch Nursery, *Carter 6878* (UC); **SCz**: Canyon above Lady's Harbor, *Carter 6014* (UC). On Santa Catalina, known only from a plant nursery, and on Santa Cruz from a single collection from an often-visited area. Needs further study, but likely introduced.

Mniaceae

Epipterygium tozeri (Grev.) Lindb.

SCa: Upper slopes above White's Landing, *Carter 5547* (UC); **SCz**: Christy Pines, *Carter 5395* (UC); **SRo**: Torrey Pines, *Shevock 20775a* (SBBG). Common on Santa Cruz and Santa Rosa in mesic woodlands. Uncommon on Santa Catalina.

Pohlia longibracteata Broth.

SCz: Cañada del Puerto, *Carter 4717* (UC). Known from a single collection along a stream bank.

Pohlia nutans (Hedw.) Lindb.

SCz: Above Dick's Harbor, *Carter 6772* (UC). Known from a single collection along a stream bank.

Pohlia wahlenbergii (F. Weber & D. Mohr) A.L. Andrews

SCz: Above Lady's Harbor, *Carter 6015* (UC); **SRo**: Cañada Lobos, *Shevock 20849* (det. Shaw) (SBBG). Uncommon and restricted to mesic areas.

Neckeraceae

Bryolawtonia vancouveriensis (Kindb.) D.H. Norris & Enroth

Reported as *Bestia vancouveriensis* (Kindb.) Wijk & Marg. by McCleary (1972). **Ana**: Reported by McCleary (1972); **SCz**: Christy Pines, *Carter 5374* (UC). Known from several collections in drainages at

mid to high elevations in Christy Pines. The voucher from Anacapa was not relocated.

**Neckera douglasii* Hook.

SCz: Christy Pines, *Carter 5386* (UC). Known from a single, depauperate population in a drainage in the upper slopes of Christy Pines. The southernmost mainland population is from a Bishop pine forests near Point Conception (Hollister Ranch, *P. Huebner s.n., May 1987* SBBG).

**Porotrichum bigelovii* (Sull.) Kindb.

SCz: Canyon above Lady's Harbor, *Carter 6017* (UC); **SRo**: Cañada Lobos, *Shevock 20852* (SBBG). Restricted to deep, shady canyons along seasonal streams, mostly near sea level.

Orthotrichaceae

**Orthotrichum bolanderi* Sull.

SCa: Several hundred meters south of the Airport, *Carter 7224* (UC). Known from a single depauperate collection mixed with *Grimmia lisae* from a crevice in a granitic boulder.

Orthotrichum coulteri Mitt.

Reported as *Orthotrichum tenellum* var. *coulteri* (Mitt.) Grout by McCleary (1972). **SBa**: Reported by McCleary (1972); ***SCa**: Rim of Silver Canyon, *Carter 6953* (UC); **SCz**: Above Dick's Harbor, *Carter 6762* (UC); **SRo**: Water Canyon, *Carter 6175* (UC). Common on oaks and other hardwoods. This species, along with *O. cucullatum*, *O. franciscanum* and *O. norrisii*, forms a complex that was until recently recognized under the name *O. tenellum*. Recent work by Medina et al. (2012) indicates that *O. tenellum* is a strictly European species and that the four Californian species in the complex all have reliable diagnostic morphological characters. Of the four, *O. coulteri* is by far the most common on the islands. In addition to *O. tenellum* var. *coulteri*, *O. tenellum* was reported by McCleary (1972) from Santa Catalina, Santa Cruz and Santa Rosa, but vouchers have not been located so it is unclear to which species these reports should be attributed.

**Orthotrichum cucullatum* F. Lara, R. Medina & Garilleti

SCa: Bulrush Canyon, *Carter 5818* (UC); **SRo**: Upper Water Canyon, *Carter 6127* (UC). Occasional on oaks in mesic areas. See discussion under *O. coulteri*.

**Orthotrichum diaphanum* Brid.

SCI: SHOBA Gate, *Carter 6628* (UC). Known from a single collection from an isolated patch of *Quercus tomentella* along the central ridgeline of the island.

**Orthotrichum franciscanum* F. Lara, R. Medina & Garilleti

Ana: *Villaseñor s.n., Feb 2011* (UC); **SCa**: Salta Verde Cutoff, *Carter 6929* (UC); **SCz**: Ridge Road, *Carter 5318* (UC); **SRo**: Torrey Pines, *Carter 6258* (UC). Common on oaks throughout the islands. See discussion under *O. coulteri*.

Orthotrichum lyellii Hook. & Taylor

Reported by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Above the Pallasades,

Carter 6937 (UC). Known from three collections, all from high elevations east of Silver Canyon. Two of these collections (*Carter 6942* & *7347*) are mixed collections with *O. papillosum*. All previous reports of *O. lyellii* from the islands are *O. papillosum* (= *O. lyellii* var. *papillosum*), which is much more common and widespread on the islands. There is some dispute as to whether *O. lyellii* comprises a single species (Vitt 2014) or two (*O. lyellii* and *O. papillosum* Norris and Shevock 2004a, b). The presence of the two mixed collections noted above indicates that the two species maintain their morphological differences even when growing in intermixed mats. On the mainland, *O. papillosum* is more common in coastal areas with *O. lyellii* more common inland, so it is not surprising that *O. papillosum* is the more common of the two on the islands.

***Orthotrichum norrisii** F. Lara, R. Medina & Garilleti
SCa: Slopes above White's Landing, *Steere s.n.*, 1–2 May 1953 (det. R. Medina) (UBC-B145567). Known from a single collection on Santa Catalina, but likely undercollected due to similarity with closely related species. See discussion under *O. coulteri* for additional discussion.

***Orthotrichum papillosum** Hampe

SCa: Bulrush Canyon, *Blakley 5476* (SBBG); ***SCI:** SHOBA Gate, *Carter 6635* (UC); **SCz:** Pine forest at Cañada Cervada, *Blakley 3725* (SBBG); ***SMi:** San Miguel Hill, *Carter 6290* (UC); **SRo:** *Hoffmann 24* (SBBG). Common throughout the islands in chaparral and oak woodlands. Previous reports of *O. lyellii* from the islands are referable to this species. See discussion under *O. lyellii*.

Polytrichaceae

***Polytrichum juniperinum** Hedw.

SCa: Ridgeline east of Divide Road, *Carter 5879* (UC); **SCz:** Canyon between Cueva Valdez and Lady's Harbor, *Carter 6002* (UC); **SRo:** Upper tributary of Water Canyon, *Shevock 20808* (SBBG). Uncommon, but locally abundant where it occurs.

Pottiaceae

***Acaulon triquetrum** (Spruce) Müll. Hal.

SCz: South rim of Central Valley, *Carter 5258* (UC). Known from a single collection, but undoubtedly undercollected due to its small size and ephemeral life history.

Aloina aloides var. *ambigua* (Bruch & Schimp.) E.J. Craig

Reported by McCleary (1972); as *A. ambigua* (BSG) Limpr. by Steere (1954); as *A. rigida* var. *ambigua* (B. & S.) Craig by Sayre (1940); as *A. ericaefolia* (Neck.) Kindb. by Williams (1923).

SCa: Italian Gardens, *Carter 5849* (UC); ***SCz:** Road to Willow's Anchorage, *Carter 6088* (UC); ***SMi:** Bluffs above Cuyler Harbor, *Carter 6295* (UC); ***SRo:** Main fork of Water Canyon, *Shevock 20830* (det. Delgadillo) (SBBG). Uncommon, mostly in more mesic areas than those occupied by *A. bifrons*.

Aloina bifrons (De Not.) Delgad.

Reported as *Aloina pilifera* by McCleary (1972); as *Aloina rigida* var. *pilifera* (BSG) Limpr., Steere (1954). **SCa:** Middle Ranch, *Carter 5588* (UC); ***SCI:** Horton

Canyon, *Carter 4344* (UC); ***SCz:** South rim of Central Valley, *Carter 4639* (UC); ***SMi:** Bluffs above Cuyler Harbor, *Carter 6303* (UC). Occasional in dry coastal scrub and chaparral.

Barbula convoluta Hedw.

Reported by Steere (1954), McCleary (1972)

SCa: Reported by Steere (1954); ***SRo:** Burma Road, *Carter 6205* (UC). Known from a single collection from the trunk of a large, relict Island oak on Santa Rosa. The population collected by Steere at White's Landing "on moist soil near water, in deep shaded canyon" was not relocated.

Crossidium crassinervium (De Not.) Jur.

Reported as *Crossidium desertorum* Holz. & Bartr. by Bartram (1933), Sayre (1940), McCleary (1972). **SNi:** No specific locality, *J.T. Howell s.n.*, 13 Mar 1932 (CAS). Known from a single historical collection.

***Crumia latifolia** (Kindb.) W.B. Schofield

SCz: Hooker Canyon, *Carter 4725* (UC). While other travertine species (e.g., *Didymodon tophaceus* and *Eucladium verticillatum*) are commonly encountered, this species is known from a single collection on the islands.

Didymodon australasiae (Hook. & Grev.) R.H. Zander

Reported as *Trichostomopsis brevifolia* Bartram by Koch (1950), Steere (1954), McCleary (1972); as *Trichostomopsis fayae* Grout by Steere (1954), McCleary (1972). **SCa:** Slopes above White's Landing, *Carter 5529* (UC); ***SCI:** Horton Canyon, *Carter 4347* (UC); ***SCz:** Ridge Road along south rim of Central Valley, *Carter 4641a* (UC); ***SMi:** Nidever Canyon, *Carter 6282* (UC); ***SNi:** No specific locality, *J.T. Howell s.n.*, 13 Mar 1923 (CAS); ***SRo:** Water Canyon, *Carter 6153* (UC). Occasional to common in dry areas throughout the islands. The San Nicolas voucher is part of a mixed collection filed under *Crossidium desertorum* (= *C. crassinervium*) at CAS.

Didymodon brachyphyllus (Sull.) R.H. Zander

Reported as *Barbula brachyphylla* Sull., Bartram (1933), Sayre (1940), Steere (1954), McCleary (1972). ***Ana:** West Anacapa, *Villaseñor s.n.*, Feb 2011 (UC); **SCa:** Valley of the Moons, *Carter 5810* (UC); ***SCI:** Knob Canyon, *Carter 5665* (UC); ***SCz:** Ridge road along southern rim of Central Valley, *Carter 5257* (UC); **SMi:** East side of Green Mtn., *Blakley 5066* (SBBG); **SNi:** Above Coast Guard Beach, *Weber B-100684* (NY); **SRo:** Near Vail Ranch House, *Blakley 3183d* (CAS). Common on dry soils.

Didymodon rigidulus Hedw.

Reported as *Didymodon mexicanus* var. *subulatus* Thériot & Bartram by McCleary (1972).

SBa: Head of Middle Canyon, *Blakley 5633* (SBBG); ***SCa:** Middle Ranch, *Carter 5587* (UC); **SCI:** Between Eel Point and Seal Cove, *Blakely 5245a* (SBBG); ***SCz:** North side of Mt. Diablo, *Carter 5984* (UC); **SMi:** Between Willow Canyon and Cardwell Point, *Blakley 5848* (SBBG). Occasional on dry soils.

Didymodon tophaceus (Brid.) Lisa

Reported by Kingman (1912), Williams (1923), Sayre (1940), Steere (1954), McCleary (1972); as *Desmatodon*

hendersonii (Ren. & Card.) Williams by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Ben Weston Canyon, *Carter* 5795 (UC); ***SCI**: Knob Canyon, *Carter* 5682 (UC); ***SCz**: Hooker Canyon, *Carter* 4722 (UC); ***SMi**: Base of Nidever Canyon, *Carter* 6294 (UC); **SNi**: Reported by McCleary (1972); ***SRo**: La Jolla Vieja Canyon, *Shevock* 20867 (SBBG). Common in seasonal drainages. Williams (1923) made the new combination *Desmatodon hendersonii* and provided an illustration of this species, which is now considered a synonym of *D. topheus*.

Didymodon vinealis (Brid.) R.H. Zander
Reported as *Barbula vinealis* Brid. by Kingman (1912), Williams (1923), Steere (1954), McCleary (1972); as *B. cylindrica* (Tayl.) Schimp., Sayre (1940), Steere (1954), McCleary (1972); as *B. subfallax* Mull. Hal. by Williams (1923). **Ana**: West Anacapa in oak grove, *Blakley* 5021 (SBBG); **SBa**: Near top of Signal Peak, *Blakley* 5668 (SBBG); **SCa**: Middle Ranch Canyon, *Carter* 4471 (UC); **SCI**: Knob Canyon, *Carter* 5691 (UC); **SCz**: Pelican Bay, *Carter* 6057 (UC); **SMi**: Canyon northwest of Green Mtn., *Blakley* 5079 (SBBG); **SNi**: South of housing area, *Blakley* 4105 (SBBG); **SRo**: Water Canyon, *Carter* 6133 (UC). Abundant throughout the islands. McCleary (1972) reported the presence of this species on all eight islands. Steere (1954) argued that the reports of *Barbula artocarpa* Lesq. by Williams (1923) belong under this species.

Eucladium verticillatum (With.) Bruch & Schimp.
Reported by Steere (1954), McCleary (1972). **SCa**: East slope of Mt. Orizaba, *Carter* 4563 (UC); **SCz**: Cañada del Puerto, *Blakely* 3986 (SBBG); **SNi**: North point of island, *Blakely* 4136a (SBBG). Occasional in seasonal drainages.

**Gymnostomum aeruginosum* Sm.

SCa: Shark Harbor, *Carter* 4499 (UC). Known from two collections.

**Gymnostomum calcareum* Nees & Hornsch.

SCa: Slopes above White's Landing, *Carter* 5511, (UC); **SCz**: Hooker Canyon, *Carter* 4730 (UC). Known from single collections from each island.

**Hennediella stanfordensis* (Steere) Blockeel

SCa: Slopes above White's Landing, *Carter* 5521 (UC); **SCz**: Cañada del Puerto, *Carter* 5424 (UC). Occasional along roads throughout Santa Catalina, and along Cañada del Puerto on Santa Cruz.

**Microbryum davallianum* (Sm.) R.H. Zander

SCa: Middle Ranch, *Carter* 5589 (UC); **SCI**: Horton Canyon, *Carter* 4346 (UC); **SMi**: Nidever Canyon, *Carter* 6296 (UC). Uncommon or overlooked in open areas with bare soil, especially in soil crusts. A specimen collected by Steere from Santa Catalina (UBC-B84231) was annotated as *M. davallianum* var. *conicum* (Schwägr.) Zander by Zander.

Microbryum starckeanum (Hedw.) R.H. Zander

Reported as *Pottia arizonica* Warehouse by Steere (1954), McCleary (1972). **SCa**: Cherry Cove, *Carter* 4517 (UC); ***SCI**: Eagle Canyon, *Carter* 4430 (UC). Uncommon or overlooked in open areas with bare soil, especially in soil crusts.

**Pseudocrossidium crinitum* (Schultz) R.H. Zander

SCa: Slopes above White's Landing, *Carter* 5528 (UC); **SCz**: Road to Willow's Anchorage, *Carter* 6090 (UC). **SRo**: Black Mountain, *Norris* 102055 (UC). Uncommon on Santa Catalina and known from single collections on Santa Cruz and Santa Rosa.

**Pseudocrossidium obtusulum* (Lindb.) H.A. Crum & L. E. Anderson

SCa: Divide Road, *Carter* 5875 (UC). Known from a single collection in *Quercus pacifica* savannah.

**Pterygoneurum ovatum* (Hedw.) Dixon

SCz: Lagunitas Secas Rd., *Carter* 5415 (UC). Known from a single collection in dry coastal scrub.

Stegonia hyalinotricha (Cardot & Thér.) R.H. Zander

Reported as *Phascum hyalinotrichum* Cardot & Thériot by Steere (1954), McCleary (1972).

SCa: Reported by Steere (1954); ***SCI**: Eagle Canyon, *Carter* 4436 (UC); ***SCz**: Lagunitas Secas Rd., *Carter* 5417a (UC); ***SMi**: Green Mountain, *Wheeler* 8031 (UC). Occasional on dry, bare soils.

**Syntrichia bartramii* (Steere) R.H. Zander

SCa: Black Jack Mountain, *Shevock* 4038 (CAS); **SCI**: Near the Salty Crab Bar, *Carter* 4322 (UC); **SCz**: Ridge Road, *Carter* 5272 (UC); **SRo**: Water Canyon, *Carter* 6142 (UC). Uncommon on dry, bare soils.

Syntrichia laevipila Brid.

Reported as *Tortula laevipila* (Brid.) Schwaegr. by Steere (1954), McCleary (1972). **SCa**: Slopes above White's Landing, *Steere s.n.* (23 May 1953, B168888) (UBC); ***SCz**: Ridge Road, *Carter* 5974 (UC). Known from two localities at upper elevations on Santa Cruz. From Santa Catalina, Steere (1954) reported "On inclined tree-trunk, about six feet from the ground, in rather open forest, at middle altitudes; sterile."

**Syntrichia papillosa* (Wilson) Jur.

SCa: Rim of Silver Canyon, *Carter* 6950 (UC); **SCI**: Ridgeline near SHOBA gate, *Carter* 6632 (UC); **SCz**: Ridge Road, *Carter* 5309 (UC). Uncommon, restricted to bark of oaks on ridgelines and, on Santa Cruz, in deep shaded canyons.

Syntrichia princeps (De Not.) Mitt.

Reported as *Tortula princeps* De Not. by McCleary (1972). ***Ana**: *Villaseñor s.n.*, Feb 2011 (UC); **SCa**: Bulrush Canyon, *Blakley* 5476c (SBBG); ***SCI**: Horton Canyon, *Carter* 4352 (UC); ***SCz**: Mt. Diablo, *Carter* 5989 (UC); **SRo**: Box Canyon, *Shevock* 20804 (SBBG). Common throughout the islands, especially on boulders and trunks of *Quercus pacifica*.

Syntrichia ruralis (Hedw.) F. Weber & D. Mohr

Reported as *Tortula ruralis* (Hedw.) Smith by Sayre (1940), McCleary (1972); as *Tortula intermedia* (Brid.) De Not., by Steere (1954), McCleary (1972); as *T. montana* (Nees) Lindb. by Williams (1923). **SBa**: Signal Peak, *Blakley* 4814 (SBBG); **SCa**: Mt. Orizaba, *Carter* 5920 (UC); **SCI**: Knob Canyon, *Carter* 5699 (UC); **SCz**: Portezuela Canyon, *Blakley* 3937b (SBBG); ***SRo**: Cherry Canyon, *Carter* 6245 (UC). Occasional and scattered throughout the islands.

Timmiella anomala (Bruch & Schimp.) Limpr.

Reported by Sayre (1940), McCleary (1972)

***SCa**: Little Geiger Canyon, *Carter 4544* (UC); ***SCI**: Horton Canyon, *Carter 4369* (UC); ***SCz**: South rim of Central Valley, *Carter 4636* (UC); ***SRo**: La Jolla Vieja Canyon, *Shevock 20878* (SBBG). Occasional throughout the islands. See notes under *T. crassinervis*.

***Timmiella crassinervis* (Hampe) L.F. Koch**

Reported as *Timmiella vancouveriensis* Broth., by Steere (1954)

SCa: Renton Mine Road, *Carter 6875* (UC); ***SCz**: Canyon below Lagunas Secas, *Carter 5955* (UC); ***SRo**: Cherry Canyon, *Blakley 3140a* (CAS). Steere (1954) reported this species (as *T. vancouveriensis*) and considered the earlier report of *T. anomala* by Sayre (1940) to be a misidentified specimen of *T. vancouveriensis*. McCleary (1972) reported only *T. anomala*. *Timmiella* is quite common on the islands especially in mesic areas in oak woodlands and chaparral, but most individuals are sterile, therefore confident determination of specimens is difficult. My general impression, however, is that *T. crassinervis* is the more common of the two species.

****Tortula acaulon* (With.) R.H. Zander**

SCa: Cottonwood Cove, *Carter 5797* (UC); **SCI**: Eel Point, *Carter 6569* (UC); **SCz**: South Rim of Central Valley, *Carter 4639b* (UC). Occasional, mostly associated with soil crusts.

****Tortula amplexa* (Lesq.) Steere**

SCa: White's Landing, *Steere s.n., 2-3 May 1953* (det. Zander) (UBC-B76611). Known from a single collection. The original population has not been relocated.

***Tortula atrovirens* (Sm.) Lindb.**

Reported by Williams (1923), Sayre (1940); as *Desmatodon convolutus* (Brid.) Grout by Steere (1954), McCleary (1972). ***Ana**: West Anacapa, *Villaseñor s.n., Feb 2011* (UC); **SCa**: Divide Road, *Carter 5573* (UC); ***SCI**: Knob Canyon, *Carter 5703* (UC); ***SCz**: Cañada del Puerto, *Carter 5421* (UC); **SRo**: Torrey Pines, *Shevock 20784* (det. Delgadillo) (SBBG). Abundant in dry areas. This is the most common species of *Tortula* on the islands.

***Tortula bolanderi* (Lesq.) M. Howe**

Reported by Steere (1954), McCleary (1972). **SCa**: White's Landing, *Steere s.n., 2-3 May 1953*, (UBC-B168581). Known from a single collection. The original population has not been relocated.

***Tortula brevipes* (Lesq.) Broth.**

Reported by Steere (1954), McCleary (1972). ***Ana**: West Anacapa, *Villaseñor s.n., Feb 2011* (UC); **SCa**: Ben Weston Canyon, *Carter 5793* (UC); ***SCI**: Eagle Canyon, *Carter 4418* (UC); ***SCz**: Lagunitas Secas Road, *Carter 5412* (UC); **SMi**: Canyon del Mar, *Blakley 5108* (SBBG); ***SNi**: No specific locality, *J.T. Howell s.n., 13 Mar 1923* (CAS); **SRo**: Water Canyon, *Carter 6145* (UC). Widespread and common. The voucher from San Nicolas is part of a mixed J.T. Howell collection filed under *Crossidium desertorum* (= *C. crassinervium*).

***Tortula californica* E.B. Bartram**

Reported by Steere (1954), McCleary (1972)
***Ana**: *Villaseñor s.n., Feb 2011* (UC); **SCa**: Cottonwood Cove, *Carter 5798* (UC); ***SCI**: Horton Canyon, *Carter*

5743 (UC); ***SCz**: Christy Pines, *Carter 4679* (UC); ***SRo**: Upper Cherry Canyon, *Shevock 20913* (SBBG). This species is ranked at rarity level 1B by the California Native Plant Society. It is quite common on San Clemente, but less so on the other islands.

***Tortula guepinii* (Bruch & Schimp.) Broth.**

Reported as *Desmatodon guepinii* BSG by Williams (1923), Sayre (1940), Steere (1954), McCleary (1972). **SCa**: Fern Canyon, *Carter 5458* (UC); ***SCI**: Eagle Canyon, *Carter 4425* (UC); ***SCz**: Central Valley, *Carter 5228* (UC); ***SMi**: Cuyler Harbor, *Carter 6299* (UC). Occasional in dry areas.

***Tortula obtusifolia* (Schwägr.) Mathieu**

***SCa**: Italian Gardens, *Carter 5851* (UC); **SCz**: Prisoner's Harbor, *Carter 5444* (UC). Uncommon in mesic areas.

***Tortula protobryoides* R.H. Zander**

Reported as *Pottia bryoides* (Dicks.) Mitt. by Steere (1954), McCleary (1972). ***Ana**: *Villaseñor s.n., Feb 2011* (UC); **SCa**: Cherry Cove, *Carter 4516* (UC); ***SCI**: Horton Canyon, *Carter 4326* (UC). Uncommon in dry areas.

***Weissia controversa* Hedw.**

Reported by McCleary (1972); as *Weissia viridula* Hedw. by Steere (1954). ***Ana**: West Anacapa, *Villaseñor s.n., Feb 2011* (UC); **SCa**: Upper Buffalo Reservoir, *Carter 5908* (UC); ***SCI**: Horton Canyon, *Carter 4354* (UC); ***SCz**: Christy Pines, *Carter 5368* (UC); ***SRo**: Water Canyon, *Carter 6139* (UC). Common in mesic areas throughout the islands.

****Weissia ligulifolia* (E.B. Bartram) Grout**

SCa: Slopes above White's Landing, *Carter 5534* (UC). Known from three collections in the upper watershed of White's Landing and Mt. Orizaba.

HORNWORTS

Anthocerotaceae

****Anthoceros fusiformis* Austin**

SCa: Ridge between Mt. Orizaba and Mt. Banning, *Carter 5930* (UC); **SRo**: Windmill Canyon, *Shevock 20865* (SBBG). Occasional in mesic areas.

Notothyladaceae

****Phaeoceros carolinianus* (Michx.) Prosk.**

SCz: Canyon between Cueva Valdez and Lady's Harbor, *Carter 5999* (UC). Uncommon.

***Phaeoceros pearsonii* (M. Howe) Prosk.**

Reported as *Anthoceros pearsoni* Howe by Kingman (1911), Evans (1923a), Steere (1954). **SCa**: Above White's Landing, *Carter 5527* (UC); ***SCI**: Horton Canyon, *Carter 4387* (UC); ***SCz**: Central Valley, *Carter 5346* (UC). Common.

LIVERWORTS

Aneuraceae

****Riccardia chamedryfolia* (With.) Grolle**

SCz: Cañada del Puerto, *Carter 4719* (UC). Known from two localities along streambanks on Santa Cruz.

Aytoniaceae

Asterella californica (Hampe ex Austin) Underw.
Reported by Evans (1923a), Steere (1954). ***Ana**: Villaseñor s.n., Feb 2011 (UC); **SCa**: Italian Gardens, Carter 5845 (UC); ***SCI**: Ridge above Twin Dams Canyon, Carter 5745 (UC); ***SCz**: Christy Pines, Blakley 3937a, (det. Doyle) (SBBG); ***SRO**: Torrey Pines, Carter 6266 (UC). Common throughout the islands.

Asterella palmeri (Austin) Underw.
Reported by Evans (1923a), Steere (1954). **SCa**: Upper Cottonwood Canyon, near the airport, Carter 7300 (UC). Known from a single locality near the airport on Santa Catalina, but locally common there.

**Cryptomitrium tenerum* (Hook.) Austin ex Underw.
SCa: Cherry Cove, Carter 7184 (UC); **SCz**: Ridge Road, Carter 5302 (UC). Rare. Known from single collections from a *Lyonothamnus* grove on Santa Cruz and a *Prunus* grove on Santa Catalina.

Calypogeiaceae

**Calypogeia azurea* Stotler & Crotz
SCz: Canyon east of Pelican Bay, Carter 6053 (UC). Known from a single collection in a deep, shaded recess near the mouth of a canyon between Prisoner's Harbor and Pelican Bay. A photo of the oil bodies is included in the specimen.

Cephaloziellaceae

**Cephaloziella divaricata* (Sm.) Schiffn. var. *divaricata*
SCa: Between Echo Lake and Twin Rocks, Carter 7321 (UC); **SCz**: Sierra Blanca Ridge, Carter 6673 (UC); **SRO**: Soledad Mountain, Shevock 20750 (det. W. Doyle) (CAS). Occasional in soil crusts and rock crevices.

**Cephaloziella divaricata* var. *scabra* (M. Howe) Haynes
SCz: Christy Pines, Carter 4671 (UC). Known from two collections along ridges on Santa Cruz, one from Bishop pine forest (on *Quercus tomentella*) and the other from a *Lyonothamnus* grove (Carter 5956 UC) on *Lyonothamnus*.

**Cephaloziella hampeana* (Nees) Schiffn. ex Loeske
SCa: White's Landing, Carter 7215 (UC). Occasional throughout Santa Catalina. Most often associated with rock outcrops or soil crusts in oak chaparral.

**Cephaloziella stellulifera* (Taylor) Schiffn.
SRO: Windmill Canyon, Shevock 20894 (CAS); **SCz**: Christy Pines, Carter 6115 (UC). Known from single collections from mesic areas on Santa Rosa and Santa Cruz.

**Cephaloziella turneri* (Hook.) Müll. Frib.
SCa: Above White's Landing, Carter 5559 (UC); **SCz**: Central Valley, Carter 5354 (UC). Occasional on Santa Cruz and Santa Catalina. Mostly associated with lichen-dominated soil crusts in chaparral and pine forests with heavy fog influence.

Fossombroniaceae

Fossombronia longiseta Austin
Reported by Evans (1923a), Steere (1954). **SCa**: Above White's Landing, Carter 5526; ***SCI**: Twin Dams

Canyon, Carter 5731 (UC); ***SCz**: Central Valley, Carter 5347 (UC); ***SRO**: Upper Windmill Canyon, Shevock 20893 (SBBG). Common in grasslands, especially on north facing slopes.

**Fossombronia pusilla* (L.) Dumort.

SCa: Upper Cottonwood Canyon, near airport, Carter 7289 (UC); **SCI**: near SHOBA gate, Carter 6599 (UC). Known from two collections on each island. Based on the available data, this species appears to prefer drier microclimates than *F. longiseta* on the islands.

Frullaniaceae

**Frullania bolanderi* Austin

Ana: Villaseñor s.n., Feb 2011 (UC); **SCa**: Canyon above Pebbly Beach, Carter 6856 (UC); **SCz**: Christy Pines, Carter 4668 (UC); **SRO**: Tributary to Water Canyon, Norris 102245 (UC). Uncommon, mostly restricted to mesic canyons. Known from single collections from Santa Cruz and Anacapa and several collections each from Santa Catalina and Santa Rosa.

**Frullania californica* (Austin ex Underw.) A. Evans
SRO: Torrey Pines, Shevock 20785 (det. Doyle) (CAS). Known from three robust collections made on Santa Rosa.

Frullania catalinae A. Evans

Reported by Evans (1897[1900], 1923a), Steere (1954). ***Ana**: Villaseñor s.n., Feb 2011 (UC); **SCa**: Between Gallagher Canyon and Wrigley Reservoir, Blakley 5368 (det. Doyle) (SBBG); ***SCI**: Knob Canyon, Carter 5662 (UC); ***SCz**: Cañada del Puerto, Carter 4592 (UC); ***SRO**: Torrey Pines, Shevock 20785 (det. Doyle) (CAS). Abundant on oaks and shaded boulders throughout the islands. The type locality of this species, described by Evans (1897[1900]), is Santa Catalina Island.

**Frullania nisquallensis* Sull.

SRO: Water Canyon, Norris 102271, (det. Doyle) (UC). Known from a single collection from a boulder in chaparral on Santa Rosa. South of San Francisco, the only specimen of this species (based on specimens at UC & CAS) is a single collection (Doyle 6126 [UC]) from the Santa Lucia Range in Monterey Co.

Geocalycaceae

**Lophocolea bidentata* (L.) Dumort.

SCz: Christy Pines, Carter 5331 (UC). Restricted to upper elevations in Christy Pines, but locally common in the understory of the pine forest. On the mainland, this species is not known south of San Luis Obispo County.

Gymnomitriaceae

**Marsupella bolanderi* (Austin) Underw.

SCa: Slopes above White's Landing, Carter 5559 (UC); **SCz**: Ridge above Pelican Bay, Carter 6065 (UC); **SRO**: Tributary to Water Canyon, Shevock 20825 (det. Doyle) (CAS). Occasional, mostly in lichen-dominated soil crusts in chaparral and woodlands.

Lunulariaceae

**Lunularia cruciata* (L.) Dumort. ex Lindb.

SCa: no voucher specimens. Observed growing as a weed with potted ornamental plants in Avalon 2012. This common greenhouse weed has not been documented growing outside of cultivation, but it exists on Santa Catalina in potted plants.

Marchantiaceae

**Marchantia polymorpha* L.

SCz: Above Lady's Harbor, *Carter 6020* (UC). Known only from near the mouths of canyons along the north side of Santa Cruz. These are popular picnicking sites for boaters, and these localized occurrences might be the result of human introductions.

Porellaceae

Porella bolanderi (Austin) Pearson

Reported by Steere (1954). **SCa:** Middle Ranch Canyon, *Carter 4472* (UC); ***SCI:** Eagle Canyon, *Carter 4398* (UC); ***SCz:** North side, above Dick's Harbor, *Carter 6742* (UC); ***SRo:** Torrey Pines, *Shevock 20787* (CAS). Common on boulders in shaded canyons.

Radulaceae

**Radula bolanderi* Gottsche ex Steph.

SCz: Christy Pines, *Carter 5376* (UC). Restricted to drainages near ridgeline in Christy Pines. Epiphytic on *Quercus* and *Heteromeles*.

**Radula complanata* (L.) Dumort.

SCz: Christy Pines, *Carter 5377* (UC); **SRo:** Black Mountain, *Norris 102064* (UC). Restricted to drainages near ridgeline in Christy Pines. Epiphytic on *Quercus* and *Heteromeles*.

Ricciaceae

**Riccia californica* Austin

SCz: Upper Islay Canyon, *Weber b-90032* (SBBG). Known from a single collection.

**Riccia campbelliana* M. Howe

SCa: Upper Cottonwood Canyon, *Carter 7299* (UC). Uncommon or possibly overlooked.

Riccia cavernosa Hoffm.

Reported as *R. catalinae* Underw. by Underwood (1894), Evans (1923a); as *Riccia crystallina* L. by Steere (1954). **SCa:** Avalon Canyon, *McClatchie 441* (NY). This species is known from several specimens labeled *Riccia catalinae* collected on Santa Catalina by McClatchie in September 1893. The holotype of *R. catalinae*, *McClatchie 441* (NY-575714), was collected "on wet soil in the bottom of a deep canyon" (Underwood 1894), probably in the vicinity of Avalon. Steere mentioned the species (as *R. crystallina*) but did not find it at White's Landing. Although Steere considered *R. catalinae* to be synonymous with *R. crystallina*, further study has resulted in the placement of *R. catalinae* in synonymy with *R. cavernosa* (Jovet-Ast 1965; Schuster 1992; Doyle and Stotler 2006). The species has not been seen on the islands since the original collections 120 years ago.

**Riccia glauca* L.

SRo: Cañada Lobos, *Norris 102354* (UC). Known from a single collection.

Riccia nigrella DC.

Reported by Steere (1954). ***Ana:** West Anacapa, *Villaseñor s.n., Feb 2011* (UC); **SCa:** Ridge above White's Landing, *Carter 5502* (UC); ***SCI:** Mail Point, *Carter 6532* (UC); ***SCz:** Road to Willows Anchorage, *Carter 6085* (UC); ***SRo:** Black Mountain, *Norris 102059* (UC). Occasional to common throughout the islands on clay soils.

Riccia sorocarpa Bisch.

Reported by Steere (1954). **SCa:** White's Landing, *Carter 7207* (UC); ***SCI:** Eagle Canyon, *Carter 4442* (UC); ***SRo:** Road north of Black Mountain, *Norris 102090* (UC). Uncommon on clay soils.

Riccia trichocarpa M. Howe

Reported by Kingman (1911), Evans (1923a), Steere (1954). **SCa:** Middle Ranch, *Carter 5595* (UC); ***SCI:** Mesa above Twin Dams Canyon, *Carter 5713* (UC); ***SCz:** Ridge road along south rim of Central Valley, *Carter 4643* (UC). Occasional on clay soils.

Sphaerocarpaceae

**Sphaerocarpos texanus* Austin

SCa: Above White's Landing, *Carter 5525* (UC); **SCI:** Eagle Canyon, *Carter 4453* (UC); **SCz:** Portezuela, *Carter 5350* (UC); **SRo:** Island Oak grove in Cañada Lobos, *Norris 102319* (UC). Uncommon on bare soils in shaded areas.

Targioniaceae

Targionia hypophylla L.

Reported by Evans (1923a), Steere (1954). ***Ana:** *Villaseñor s.n., Feb 2011* (det. Carter) (UC); **SCa:** Shark Harbor, *Carter 4501* (UC); ***SCI:** Ridge above Twin Dams, *Carter 5726* (UC); ***SCz:** Above Lady's Harbor, *Carter 6022* (UC); ***SMi:** Cuyler Harbor, *Carter 6302* (UC); ***SRo:** Torrey Pines, *Shevock 20779* (SBBG). Abundant on soil in many habitats throughout the islands.

APPENDIX 2

EXCLUDED SPECIES

Fossombronia hispidissima Steph.

Reported by Steere (1954) from near the shoreline at White's Landing. At the time of Steere's publication, the boundaries between *F. hispidissima*, *F. longiseta* and *F. pusilla* were subject to dispute (Evans 1923b; Steere 1954). Doyle and Stotler (2006) recognized *F. longiseta* and *F. pusilla* from southern California, but *F. hispidissima* from California was considered to be synonymous with *F. longiseta*. Both *F. longiseta* and *F. pusilla* are now documented from the islands.

Riccia violacea M. Howe

Steere (1954) reported a Channel Island specimen confirmed by R. L. McGregor. However, Doyle and Stotler (2006) were unable to find the voucher, or any

other voucher from the state, at CAS, NY, UBC, UC and other herbaria, and so excluded this species from their California state list.

Brachythecium albicans (Hedw.) Schimp.

This species was first reported from Santa Rosa by McCleary (1972) based on *Blakely 3064c* (SBBG), collected at the junction of Cherry Canyon and Windmill Canyon, and *Blakely 3057b* (SBBG) from between Johnson Lee and South Point. Both specimens are *Homalothecium arenarium*. Another specimen labeled *B. albicans* from Santa Rosa, *Shevock 20839* (SBBG), is *Scleropodium californicum*. *Brachythecium albicans* has been generally misunderstood in coastal southern California and most specimens from that area are misidentified collections of *Scleropodium* or *Homalothecium*.

Bryoerythrophyllum recurvirostrum (Hedw.) P.C. Chen
Reported by McCleary (1972) from "Creek bank behind Vail House" on Santa Rosa based on *Blakely 3065-a* (CAS). This specimen is *Didymodon vinealis* (det. D. Toren viii, 2011). *Bryoerythrophyllum* is known from the Santa Monica Mountains on the adjacent mainland (Sagar 2007) but no confirmed vouchers are known from the islands.

Eurhynchium pulchellum (Hedw.) Jenn.

There was previously confusion between *Eurhynchium* species and *Scleropodium touretii* in southern California. Sayre (1940) reported *E. strigosum* (Hoffm.) B. & S. from Santa Catalina and *E. strigosum* var. *scabrisetum* Grout from Santa Catalina and Santa Cruz. Steere (1954) included these as *E. pulchellum* (Hedw.) Jenn. and *R. pulchellum* var. *scabrisetum* Grout but expressed skepticism based on the known distributions of *Eurhynchium* species much farther to the north in western North America. He also stated that they possibly may have been misidentified specimens of *Scleropodium illecebrum* (= *S. touretii*). Norris and Shevock (2004a) did not list material of the *Eurhynchium* species from southern California, and my collecting has not documented them from the islands. The vouchers on which Sayre's reports were made have not been relocated, but based on current understanding of the distributions of *Eurhynchium* species, these are excluded from the flora.

Grimmia apocarpa var. *atrofusca* (Schimp.) Husn.

Reported from Santa Rosa by McCleary (1972), based on *Blakely 3049a* (CAS), from the trunk of an Island Oak at the Air Force Radar Station. The specimen is *Grimmia trichophylla*.

Grimmia involucrata Cardot

McCleary (1972) reported the species with the following note: "Scattered on silt deposits over rocks. Elevation 400 ft. First large canyon west of Profile Point. Santa Cruz Island." A voucher number was not cited, and the specimen has not been relocated, though it is most likely at CAS as are other specimens cited by McCleary. The report is undoubtedly based on a misidentified specimen, as recent revisionary work on *G. involucrata* found that species to be endemic to México (Delgadillo 1999).

Grimmia ovalis (Hedw.) Lindb.

Reported from Santa Cruz by McCleary (1972). The voucher for this report, *Blakeley 3371b* (SBBG), is *G. laevigata*.

Haplocladium microphyllum (Hedw.) Broth.

First reported from Santa Catalina as *Thuidium microphyllum* (Hedw.) Best, by Sayre (1940), but without a voucher. This taxon was not relocated by Steere (1954) and has not been seen since Sayre's original report. The voucher from Sayre's original report, presumably a Cockerell specimen, could not be located at CAS, COLO, SBBG, and UC. The current understanding of this species is that it is absent from California and adjacent states.

Homalothecium aeneum (Mitt.) E. Lawton

Reported by McCleary (1972); as *Camptothecium dolosum* Ren. & Card. by Williams (1923); as *C. aeneum* var. *dolosum* (Ren. & Card.) Grout. by Sayre (1940), Steere (1954). Reported by both Williams and Steere from Santa Catalina, but these specimens (which have not been relocated) most likely represent morphological variants of *H. nuttallii*. See notes under that species for further discussion.

Molendia sendtneriana (Bruch & Schimp.) Limpr.

Reported as *Anoetangium obtusifolium* (Broth. & Par) Grout by Steere (1954), McCleary (1972). This was reported from Santa Catalina based on a specimen from above White's Landing, *Steere s.n., 2 May 1953*, (UBC-B76127). The specimen could not be relocated for this study, but Zander (2007) did not list the species from California in his *Flora of North America* treatment and Malcolm et al. (2009) excluded it from the list of species known from California. Previously the species had been thought to occur in the state only based on the specimen above (Norris & Shevock 2004b).

Orthotrichum flowersii Vitt

Reported by Norris and Shevock (2004a, b) from Santa Catalina based on *Shevock 4073* (CAS). This specimen was determined as *O. franciscanum* by Lara & Garilleti, xi, 2008.

Orthotrichum speciosum Nees

Reported by McCleary (1972) from San Clemente, but a voucher has not been located at CAS, UC, or SBBG. This species is not known to occur in coastal California south of San Francisco, and is typical of Northern California and the Sierra Nevada. The report is likely based on a mis-identified specimen.

Orthotrichum tenellum Bruch ex Brid.

Reported by Steere (1954), McCleary (1972) and (as *O. cylindrocarpum* Lesq.) by Williams (1923), Sayre (1940). Although Vitt (2013) recognizes this species in California, more recent work by Medina et al. (2013) demonstrates convincingly that specimens formerly assigned to *O. tenellum* from California belong to one of four other species. See additional discussion under *O. coulteri*.

Syntrichia obtusissima (Müll. Hal.) R.H. Zand.

Reported as *Tortula obtusissima* (Müll. Hal.) Mitt. by McCleary (1972) from Santa Cruz Island. The voucher, *Blakely 3373* (SBBG) is *S. princeps*.

A CATALOGUE OF THE MOSSES OF PLUMAS NATIONAL FOREST, CALIFORNIA

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ABSTRACT

245 described species, two undescribed species and four varieties of moss are documented on the Plumas National Forest, California representing approximately 35% of the California moss flora. Nineteen species are new records for the Sierra Nevada mountain range of California. The high rainfall on the western slope of the forest and associated habitat conditions allow for many disjunct coastal species. Four species, *Pohlia flexuosa* Harv. in Hook., *Schistidium subulaceum* H.H. Blom, *Scopelophila ligulata* (Spruce) Spruce, and *Sphagnum angustifolium* (Russow) C. Jensen in K. R. Tolf, were found new to California during this study. Five species, *Gemmabryum vinosum* J.R. Spence & Kellman, *Homalothecium californicum* Hedenäs, Huttunen, Shevock & D.R. Norris, *Orthotrichum confusum* R. Medina, F. Lara & Garilleti, *Ptychostomum pacificum* J.R. Spence & Shevock, and *Schistidium splendens* T.T. McIntosh, H. H. Blom, Toren & Shevock were recently described, partially using material collected as part of this study.

Key Words: Bryophytes, Butte County, moss, Northern California, Plumas County, Sierra County, Yuba County.

As part of a larger effort to more fully understand distribution patterns of bryophytes in California, it is necessary to systematically and carefully catalogue smaller geographical regions and political entities. Several collectors are contributing in this regard: David Toren in Lake and San Francisco counties, James Shevock in the southern Sierra Nevada and San Francisco County, Ken Kellman in Santa Cruz County, Paul Yurky (1995) in Marin County, and Alan Whitemore in San Mateo County. This study is an effort to fill in the void for the Plumas National Forest, which includes portions of Plumas, Butte, Sierra and Yuba counties, and by extension, the northern Sierra Nevada of California.

The Plumas National Forest is located approximately 20 km (12 mi) east of Oroville, California (see Fig. 1), and lies largely within the Sierra Nevada Mountain Range. The northeast portion of the National Forest is in the Diamond Mountains, with the portion north of the North Fork Feather River technically part of the Cascade Mountain Range. The Plumas National Forest covers approximately 8417 km² (3250 mi²). Elevation ranges from 488 m (1600 ft) near the shores of Lake Oroville to 2552 m (8372 ft) at the top of Mt. Ingalls. The vast majority of the Plumas National Forest is drained by the Feather River with two notable exceptions. The southeast portion is drained by the North Yuba River, and the eastern escarpment drains into Honey Lake.

CLIMATE

The study area is dominated by a Mediterranean climate, with mild and wet winters, and

warm and dry summers. Average rainfall varies greatly throughout the study area. The highest rainfall areas (average annual precipitation) are on the western portion of the study area at La Porte (2.05 m avg.) to more moderate annual precipitation at Quincy (0.97 m avg.) to dryer eastern portions of the study area at Portola (0.58 m avg.). Precipitation on the eastern portion of the study area is in the rain shadow of the Sierra Crest, and this portion of the study area is more influenced by Great Basin weather patterns. Therefore precipitation is more evenly spaced throughout the year than on the western portion of the study area, which is more heavily influenced by California's Mediterranean climate. Virtually all precipitation west of the Sierra crest falls between late October and early May. Elevations below 1219 m (4000 ft) are dominated by rain and elevations over 1219 m are dominated by snow (Troendle et al. 2007). Snow primarily falls between November and March. The vast majority of the moss substrate stays dry throughout the summer, with the obvious exception of wetland-type habitats. Shade created by dense forests moderates hot summer temperatures. Cold air sinks into steep river canyons. Combinations of these geographical and meteorological factors create a wide variety of microclimates.

MAJOR PLANT COMMUNITIES

Mixed coniferous and deciduous forests are the signature plant community of the National Forest, occupying much of the lower and middle elevations. These forests are variously composed of white fir (*Abies concolor* [Gordon & Glend.] Lindl.

ex Hildebr.), Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), incense cedar (*Calocedrus decurrens* [Torr.] Florin), ponderosa pine (*Pinus ponderosa* P. Lawson & C. Lawson), Sugar Pine (*Pinus lambertiana* Douglas) and black oak (*Quercus kelloggii* Newb.). At lower elevations, such as in the Challenge area, tanoak (*Lithocarpus densiflorus* [Hook. & Arn.] Rehder) and madrone (*Arbutus menziesii* Pursh) become common components of the forest.

Red fir (*Abies magnifica* A. Murray bis) forests occur above 1676 m, and associated snowfall is heavy. The east side of the forest is dominated by yellow pine, both Jeffrey (*Pinus jeffreyi* Balf.) and ponderosa. The understory of east side pine forests often contains sagebrush (*Artemisia* L.), rabbitbrush (*Ericameria* Nutt.), and bitter brush (*Purshia tridentata* [Pursh] DC.). There are several types of oak woodlands and most are found at lower elevations on the western portion of the forest. Black oak is found in pure stands in a number of areas. Interior live oak (*Q. wislizenii* A. DC.) woodlands and canyon oak (*Q. chrysolepis* Liebm.) woodlands are found on steep slopes on canyon walls on the west slope.

Wet riparian zones of lower elevations of the western portion of the forest contain a host of tree species including big-leaf maple (*Acer macrophyllum* Pursh), Pacific yew (*Taxus brevifolia* Nutt.), California bay (*Umbellularia californica* [Hook. & Arn.] Nutt.), and white alder (*Alnus rhombifolia* Nutt.).

There are a variety of shrublands in the forest including types dominated by manzanita (*Arctostaphylos* Adans.), bitter cherry (*Prunus emarginata* [Douglas] Eaton), deer brush (*Ceanothus integrifolius* Hook. & Arn.), mountain whitethorn (*C. cordulatus* Kellogg), tobacco brush (*C. velutinus* Douglas), as well as lower elevation chaparral that includes species such as toyon (*Heteromeles arbutifolia* [Lindl.] M. Roem).

High elevation wet meadows, springs, seeps and fen habitats are all important habitat types for bryophytes. These habitat types are uncommon, but are well represented by collections in this catalogue. Grasslands are common in valleys in private lands in the area of the flora, but are under represented in survey effort and collections.

GEOLOGY

The geology of the Plumas National Forest is diverse. There are areas with sedimentary, igneous, and metamorphic rocks. Sedimentary rocks include sandstone, shale, and limestone; basalt (volcanic) and granite (plutonic) among the igneous rocks; and marble and slate among the metamorphic rocks.

Granite, basalt, volcanic breccias, andesite, shale, and slate are among the most common rock types in the study area. Other less common

types include: volcanics such as rhyolite, metamorphic such as serpentinite and soapstone, and sedimentary types such as chert and sandstone. Very little limestone or marble occur in the Plumas National Forest and associated calcareous habitats and associated mosses are rare. Some of these limestone deposits were developed during the Paleozoic Era and are marine deposits. They are found just south of Eureka Peak and others are found in the Middle Fork Feather River at Milsap Bar and Little Volcano Mountain (Clifton 2003). Travertine, a variety of limestone deposited from underground water that has returned to the surface as a spring also occurs on the Plumas, such as along Hwy 89 near Indian Falls on Indian Creek (Durrell 1987). For a thorough understanding of the geology of the area, readers should refer to the *Geologic History of the Feather River Country, California* by Durrell (1987).

COLLECTION HISTORY

There is a limited history of bryophyte collection within the Plumas National Forest. The oldest collections definitely traceable to the Plumas National Forest were made in 1893 by Rebecca Merritt Austin. Prior to this study, only sporadic and short-term visits have been made to the county by a variety of collectors. The most notable among these are Leiberger (1900), Ikenberry (1933–1934), L. Koch (1934–1947), Elva Lawton (1955), B. Weber (1975), D. Showers (1976), and L. Janeway (1998–1999). Until this study, there has never been a concentrated effort to inventory the bryophytes of the Plumas National Forest.

METHODS

This project was initiated on the unlikely date of September 11, 2001, just hours after the terrorist attack on the twin towers in New York City. A group of botanists assembled including Dan Norris, Nancy Hillyard, Linnea Hanson, and the author for a three day bryophyte collecting trip around the Plumas National Forest. It was during this initial trip that the author recognized the lack of understanding of the bryoflora of the region. Since that initial collecting foray, the author has continually gathered moss collections from 2001 to 2015, from diverse locations and elevations throughout the study area. Many general localities were collected more than once at different times of the year. Collection data recorded on herbarium specimens includes Universal Transverse Mercator (UTMs), Legal Location (Township, Range, and Section), elevation, substrate and habitat. UTM's were mostly determined with a handheld global positioning system (GPS) receiver. Occasionally, UTM's were estimated by plotting the location using ArcGIS and USGS Topographic maps. These collections are housed in the

following herbaria: Rebecca Merritt Austin herbarium located in the Plumas National Forest offices in Quincy and Oroville (RMA), University of California Berkeley (UC), California State University at Chico (CHSC), California Academy of Sciences (CAS), Duke University (DUKE), Florida Museum of Natural History (FLAS), Missouri Botanical Garden (MO), University of Alaska Museum of the North (ALA), Polish Academy of Sciences (KRAM), Universidad Autonoma de Madrid (MAUAM), University of British Columbia (UBC), Flatberg (personal herbarium). Specimens duplicated at RMA are not specifically acknowledged if also deposited at another herbarium. A large portion of the RMA herbarium is in the process of being transferred to CAS.

Herbarium searches were conducted on line for MO, NY, and CHSC. A list of specimens from the study area were provided by CAS and CHSC and labels examined. Site visits to UC and CHSC were conducted and specimens were examined. Individual specimens from CAS, CHSC, and UC herbaria were borrowed and have been examined. Nearly all species in this catalogue have been independently determined by at least two bryologists. A few species that were represented in the catalogue by a single collection or that were identified by a single examiner have a note following the species account in Appendix 1 indicating that the species was not verified by multiple bryologists.

Identification of specimens has been accomplished using various moss floras from North America and beyond (Flora of North America Editorial Committee 2007, 2014; Malcolm et al. 2009; Norris and Shevock 2004b; Crum and Anderson 1981; Flowers 1973; Lawton 1971; Sharp, Crum and Eckel 1994; Smith 1978). Difficult collections were sent to appropriate authorities for confirmation or determination. See the acknowledgement section for a list of bryologists who made or confirmed determinations.

RESULTS

Approximately 2400 specimens were examined, including over 2000 that were made by the author. Two hundred and forty-five (245) species and four varieties in 102 genera were documented in the study area (see Appendix 1) representing approximately 35% of the California moss flora. Of these species, nineteen are reported new to the Sierra Nevada of California. Four species were reported as new to California based on this study: *Pohlia flexuosa* Harv. in Hook., *Schistidium subjulaceum* H.H. Blom, *Scopelophila ligulata* (Spruce) Spruce and *Sphagnum angustifolium* (Russov) C. Jensen. Five species, *Gemmabryum vinosum* J.R. Spence & Kellman, *Homalothecium californicum* Hedenäs, Huttunen, Shevock & Norris, *Orthotrichum confusum* R. Medina, F. Lara & Garilleti, *Ptychostomum pacificum* J.R. Spence & Shevock

and *Schistidium splendens* T.T. McIntosh, H.H. Blom, D.R. Toren & Shevock were recently described partially using material collected from this study.

Two taxa collected during this study are presently undescribed. These may be described by various authors in other publications.

Collections made during this study within the genus *Scleropodium* Bruch & Schimp. were used by Carter (2014b) to aid with a global revision to the genus.

The catalogue is divided into four sections. All are sorted alphabetically by genus and then by species. Appendix 1 includes all described species and varieties that have been inventoried for the Plumas National Forest and encompassed lands of other ownership. It includes a subjective assessment of the abundance of the species, a short description of the habitats of the moss, regularity of sporophyte occurrence, and a few representative collections illustrating the range of the species. Emphasis for the selection of cited collections is given to represent a minimum of one collection for each of the four counties if available. Collections have also been chosen to highlight elevational extremes, variation in habitat, and those by a variety of collectors and of earliest record. Specimens that have been verified by more than one bryologist are favored over those identified by only one person.

Subjective abundance is assessed as follows: **Rare**, found only once or twice in the study area and not known in large quantities from neighboring areas; **Uncommon**, found occasionally within appropriate habitat; **Common**, regularly within appropriate habitat; **Abundant**, most often found in large quantities within appropriate habitats. This information is entirely from the author's experience and collections in the study area, and from discussions with other California bryologists. Whereas the number of collections examined is commonly used as an indication of abundance, that number can be misleading. Often collections are made in the field because two species are macroscopically similar, thus overemphasizing the relative abundance of one or the other. Similarly, certain uncommon or special status and distinctive species (*Meesia* Gaertn. for example) are generally collected every time they are encountered, while easily recognized abundant species are often under collected. Many groups are undercollected, such as ephemeral mosses, and abundance estimates are likely conservative. This is a preliminary effort, and with more collections, abundance estimates are likely to change.

Collection data are listed with the following fields: County: habitat, short geographical location, reference to nearest community or recognizable landmark, year, elevation, collector, collection number, and herbarium. The initials CPD designate collections by the author. Nomenclature follows the standards set in the recently

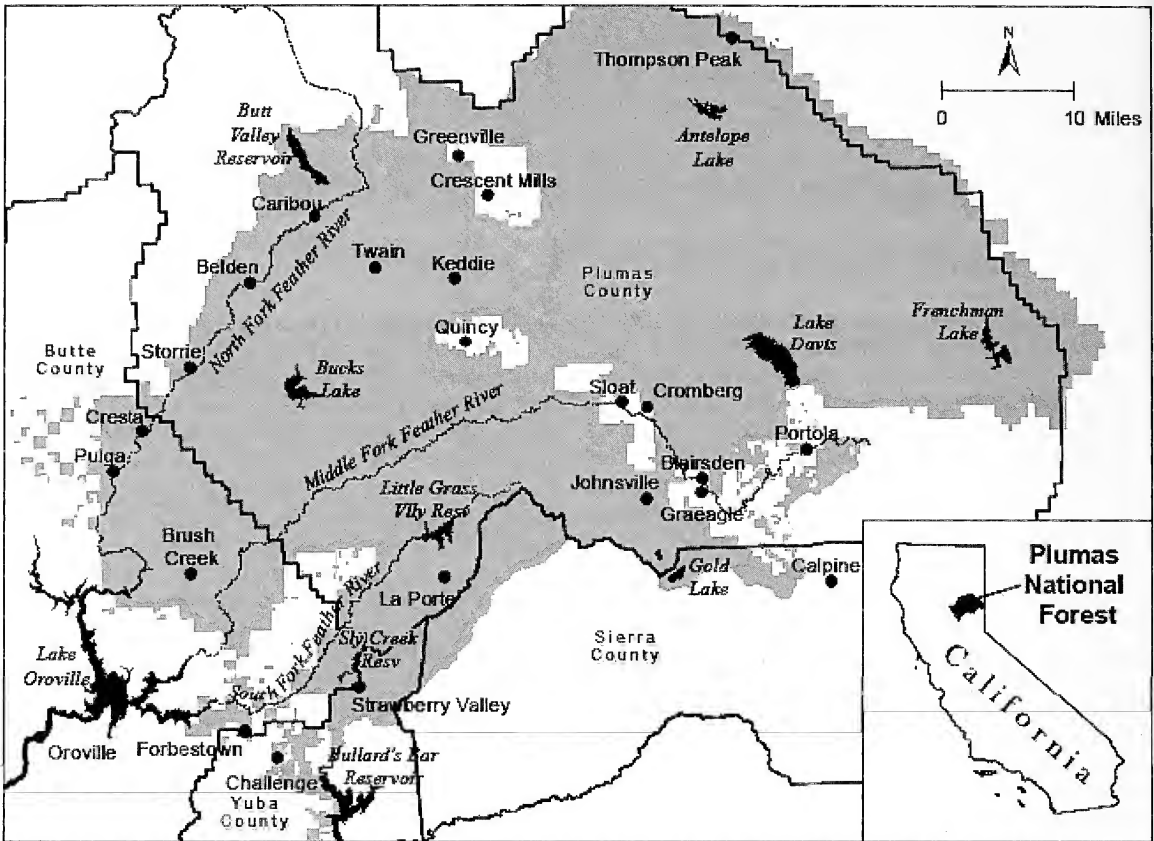


Figure 1. Study area of Plumas National Forest (gray shaded area) with Butte, Plumas, Sierra and Yuba counties (black lines). Place names included for geographic reference in association with collections in catalogue (Appendix 1). Inset: map of California showing Plumas National Forest in dark gray shaded area.

completed Flora of North America (2007, 2014) project. The Missouri Botanical Garden's online Tropicos database (2014) was consulted often to help clarify valid taxa. Where I have deviated from these works, I have added a note to explain my reasoning. Collections give spatial references to communities or well-known localities in the study area. Locations for these sites can be seen in the map in Figure 1.

Recent published work has changed some generic concepts for species widespread in the study area. Some genera published in Norris and Shevock (2004), which is a common resource for California field bryologists, are now listed under other generic names. *Bryum* Hedw. and *Racomitrium* Brid. are two such widespread genera with many species in the study area.

The genus *Bryum* has recently been split into several genera (Spence 2014). This author has decided to follow the new generic segregates. The following genera include species previously located in *Bryum sensu lato*. *Gemmabryum* J.R. Spence & H.P. Ramsay includes *G. badium* (Brid.) J.R. Spence, *G. barnesii* (J.B. Wood ex Schimp.) J.R. Spence, *G. caespiticium* (Hedw.) J.R. Spence, *G. dichotomum* (Hedw.) J.R. Spence

& H.P. Ramsay, *G. vinosum*, J.R. Spence & Kellman, and *G. violaceum* (Crundw. & Nyholm) J.R. Spence. *Imbriobryum* N. Pedersen includes *I. alpinum* (Huds. ex With.) N. Pedersen, *I. gemmiparum* (De Not.) J.R. Spence, *I. minutum* (Lesq.) J.R. Spence, *I. muehlenbeckii* (Bruch & Schimp.) N. Pedersen, and *I. torenii* J.R. Spence & Shevock. *Ptychostomum* Hornsch. includes *P. creberrimum* (Taylor) J.R. Spence & H.P. Ramsay, *P. pacificum* J.R. Spence & Shevock, *P. pseudotriquetrum* (Hedw.) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pedersen, and *P. weigeli* (Spreng.) J.R. Spence. *Rosulabryum* J.R. Spence includes *R. canariense* (Brid.) Ochyra, *R. capillare* (Hedw.) J. R. Spence, *R. gemmascens* (Kindb.) J.R. Spence, and *R. torquescens* (Bruch & Schimp.) J.R. Spence. The account for genus *Bryum sensu stricto* and the remaining four genera are arranged alphabetically in this flora.

Racomitrium, in the broadest sense, is a recognizable group of mosses based on the combined characters of basal cells having thick and sinuous cell walls, cladocarpous habit and with linear peristome teeth that are divided nearly to the base. However, recent studies by Ochyra and Benarek-Ochyra (Ochyra 2007) culminated in splitting

this group at the genus level into four genera, *Racomitrium* in the narrow sense, *Bucklandiella* Roiv., *Codriophorus* P. Beauv., *Niphotrichum* (Bednarek-Ochyra) Bednarek-Ochyra & Ochyra, and more recently Sawicki et al. (2015) created a new monospecific genus, *Frisvollia* Sawicki, Szczecińska, Bednarek-Ochyra & Ochyra. However, Larrain et al. (2013) make an excellent case using molecular data that the genus *Racomitrium* should be recognized in the broadest sense, and suggest using the traditional generic concept of *Racomitrium*. Although I would like to follow Larrain et al. (2013) and lump *Racomitrium*, I instead have decided to be consistent with leading California field bryologists (J. Shevock, D. Toren and K. Kellman, personal communication 2015) and follow the generic splits used by Ochyra (2007) and Sawicki et al. (2015).

Appendix 2 is an annotated list of the excluded species previously published from the study area.

Appendix 3 is a short list of mosses that might reasonably be expected to be found in the Plumas National Forest, but have yet to be collected. Plants are included in this section if they have been collected in nearby counties, and appropriate habitat exists in the Plumas National Forest. Due to the preliminary nature of this study, it would not be surprising to find at least some of these taxa in the study area, as well as others that are not on this list.

Appendix 4 lists mosses by several habitat types. Some of the mosses reported from each habitat are not necessarily strictly associated with that habitat, but have been found in that habitat on the Plumas National Forest.

DISCUSSION

It is evident that the limited collection history on the Plumas National Forest has resulted in a limited knowledge of the moss flora. Two apparent species found in the study area are as yet undescribed. The nineteen mosses that are new to the Sierra Nevada Mountains represent major range extensions for their respective taxa. It remains to be seen if these collections represent continuous range extensions or disjunct populations.

The position of the western slope of the Plumas National Forest is in a high rainfall zone (approximately two meters per year) and has a similar climate to that of the Coast Range. Several species, otherwise not known from the Sierra Nevada Mountain Range, have been found in this area with a high moisture regime and represent major range extensions for these taxa. This is the case with such taxa as *Alsia californica* (Hook. & Arn.) Sull., *Brachythecium acutum* (Mitt.) Sull., *Buxbaumia viridis* (DC.) Moug. & Nestl., *Campylopus introflexus* (Hedw.) Brid., *Dicranum howellii* Renaud & Cardot, *Didymodon eckeliae* R.H. Zander, *Entosthodon attenuatus* (Dicks.) Bryhn,

Epipterygium tozeri (Grev.) Lindb., *Fissidens pauperculus* M. Howe, *Homalothecium megaptitulum* (Sull.) H. Rob., *Hypnum circinale* Ando, *Neckera douglasii* Hook., *Rhynchostegium aquaticum* A. Jaeger, *Pohlia annotina* (Hedw.) Lindb., *Rhytidadelphus triquetrus* (Hedw.) Warnst., and *Sphagnum angustifolium* (refer to Appendix 1 for full authorities).

The Mediterranean climate also allows for a rich suite of species that inhabit the trunks of trees at lower elevations (<3,000 ft) in the study area. Many hardwood tree trunks, and even some Douglas-firs, have the lower six feet or so completely covered in mosses in mesic riparian zones, and many of the epiphytic mosses (e.g., *Dendroalsia abietina* [Hook.] E. Britton ex Broth., *Isoetichum cristatum* [Hampe] H. Rob. and *Orthotrichum papillosum* Hampe) are abundant. Temperatures are cool in the winter when the bark is wet, providing ideal conditions for bryophyte growth. Higher temperatures are present only in the summer, when the mosses are protected by desiccation (Shaw and Goffinet 2000). This is not the case for higher elevations in the study area where epiphytic mosses are limited by a lack of available water in the winter, and in the summer, when occasional storms do bathe the trunks; temperatures are too high for optimal growth.

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APPENDIX 1

Catalogue: taxa preceded by an asterisk (*) denote those not known to have been collected from the Sierra Nevada Mountain Range prior to this study. Those marked with a double asterisk (**) denote taxa that are reported new to California. Controversial or recently changed names are listed below the name that I have accepted for the taxon.

**Alsia californica* (Hooker & Arnott) Sullivant
Rare; on the bark of trees. Sporophytes present on only collection.

Yuba: on *Lithocarpus densiflorus* tree bole mixed with *Dendroalsia abietina*, three mi SE of Challenge, 2003, 2350 ft, *CPD* 989 (CAS, UC).

Amblystegium serpens (Hedwig) Schimper
Common; on wood and moist soil around water. Sporophytes common.

Plumas: on *Darmera peltata* (Torr. ex Benth) Voss roots in Grizzly Creek, two mi SW of Bucks Lake, 2004, 5028 ft, *CPD*, *Toren & Friend* 1560 (CAS); on *Abies magnifica* log in fen-like wetland at headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6907 ft, *CPD & Toren* 1666 (CAS); on saturated wood in spring in headwaters of Betterton Creek, two mi NE of Graeagle, 2004, 5490 ft, *CPD* 1502 (UC).

Note: I concur with Crum and Anderson (1981) in that *Amblystegium juratzkanum* Schimper and *A. serpens* represent a nearly impossible continuum and I have followed their work. To base separation on a character such as wide-spreading leaves in species that occur in changing environments is unreasonable. Specimens previously determined as *A. juratzkanum* are listed as *A. serpens* for this work (*CPD & Toren* 1660 [CAS], *CPD & Toren* 1695 [CAS, UC]). Vanderpoorten, in his *Flora of North America* (2014) treatment of *Amblystegium*, also agrees with this interpretation.

Amphidium californicum (Hampe ex Müller Hal.) Brothaus
Uncommon; on shaded rocks. No collections with sporophytes.

Butte: on ephemerally moist vertical rock face under rock overhang along Ponderosa Rd, two mi NW of Forbestown, 2003, 1588 ft, *CPD* 1125 (UC); on massive granitic rock in Feather River Canyon immediately E of Arch Rock, 2006, 1575 ft, *Shevock* 28914 (CAS).

Plumas: on metamorphic rock on Middle Fork Feather River at Red Bridge Campground, about six mi SE of Quincy, 2002, 3900 ft, *Laeger* 1573 (CAS). **Sierra**: on shaded rock crevice of rock outcrop above Rock Creek, six mi S of LaPorte, 2005, 3800 ft, *CPD* 1908 (RMA).

Anacolia baueri (Hampe) Paris
Uncommon; generally on shaded, moist rocks, generally vertical and substantial. One collection with sporophytes.

Butte: on ephemerally moist vertical rock face under rock overhang along Ponderosa Rd, two mi NW of Forbestown, 2003, 1588 ft, *CPD* 1126 (UC). **Plumas**: on moist vertical rock adjacent to cascading tributary of Greenhorn Creek, seven mi E of Quincy, 2004, 3794 ft, *CPD* 1291 (RMA); on open volcanic conglomerate rock in ephemeral seep with no canopy in mixed *Purshia tridentata* and *Artemisia tridentata* shrub community, two mi N of Graeagle, 2005, 5387 ft, *CPD* 1481 (RMA). **Sierra**: on shaded crevice of rock outcrop above Rock Creek, six mi S of LaPorte, 2005, 3800 ft, *CPD* 1897 (RMA).

Note: *Flora of North America* treats this as a subspecies of *A. menziesii*. I have followed Norris and Shevock (2004a) in recognizing it at species level. I used branch tip characters identified by Norris and Shevock (2004b) to determine species when sporophytes were not present.

Anacolia menziesii (Turner) Paris
Uncommon; on shaded rocks of road cuts or outcrops in forest. Sporophytes common.

Butte: on granitic rock on road cut, along Hwy 70, 10 mi NE of Paradise, 2009, 1500 ft, *CPD* 2555 (CAS). **Plumas**: on dry rock along Yellow Creek Trail, 16 mi NW of Quincy, 2006, 2280 ft, *CPD*, *B. Shaw*, *Shevock & Kellman* 2360 (CAS); on dry rock talus along North Fork Feather River Trail, 15 mi NW of Quincy, 2006, 3000 ft, *CPD*, *Kellman*, *B. Shaw*, *Slack*, *Shevock & Wilson* 2358 (RMA).

Andreaea heinemannii Hampe & Müller Hal.

Uncommon; on rock outcrops under sparse to dense forest canopy. Sporophytes common.

Butte: on granite outcrop, 1.5 mi W of Cresta and 18 mi E of Chico, 2004, 3036 ft, *CPD & Toren 1740* (ALA, CAS). **Plumas:** on dry granite outcrop, five mi S of Antelope Lake, 4677 ft, *CPD & Toren 2201* (ALA, CAS); on granite boulder under dense forest canopy, three mi NW of Johnsville, 2008, 5280 ft, *CPD 2438* (ALA). **Sierra:** on metamorphic rock outcrop under light forest canopy, three mi E of LaPorte, 2005, 4961 ft *CPD & Toren 2300* (UC).

Note: all specimens were determined or verified by Barbara Murray at University of Alaska.

Anomobryum julaceum (Schrader ex P. Gäertner, B. Meyer & Scherbius) Schimper

Rare; on thin soil over rock at low elevations. No collections with sporophytes.

Butte: on thin soil in ephemeral moist, near-vertical, rocky road cut on Camp Creek Rd, 0.7 mi NE of Pulga, 2004, 1607 ft, *CPD 1728* (MO – verified by Zander, UC, CHSC); on thin granitic sandy soils over rock 100 yards up dirt road from Shady Rest Area, 2006, 1560 ft, *CPD 2345* (CAS).

Antitrichia californica Sullivant ex Lesquereux

Common; on the bases of hardwood trees, especially *Quercus kelloggii* and less commonly on conifers, also common on rocks in diffuse or full sunlight. Sporophytes uncommon.

Butte: on rock in dry creek bed under forest canopy in the headwaters of Brush Creek, 1/2 mi E of Brush Creek community, 2002, 3680 ft, *CPD 854* (CAS); on rock outcrop under dense forest canopy in the headwaters of Woodleaf Creek, 1 mi N of Woodleaf, 2003, 2940 ft, *CPD 1004* (CAS); on *Acer macrophyllum* bole on edge of meadow, three mi NE of Forbestown, 2003, 2900 ft, *CPD 1100* (CAS). **Plumas:** on base of *Quercus kelloggii* at Mt. Hough Ranger Station, three mi N of Quincy, 2003, 3400 ft, *CPD 815*, (MO). **Sierra:** on bark of fallen old-growth *Pseudotsuga menziesii* under forest canopy and adjacent to Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD 1865* (CAS). **Yuba:** on base of *Quercus kelloggii*, six mi SE of Challenge, 2003, 2740 ft, *CPD 948* (CAS).

Atrichum selwynii Austin

Common on soil of stream banks in the shade. Sporophytes common.

Butte: on soil under forest canopy in the headwaters of Mosquito Creek, 1/4 mi N of Brush Creek community, 2002, 3057 ft, *CPD 517* (UC); on thin duff layer over mineral soil at margin of Lockerman Creek underneath dense forest canopy, two mi NW of Cresta, 2004, 3140 ft, *CPD & Toren 1781* (CAS). **Plumas:** on soil in splash zone of small waterfall along tributary to South Branch Middle Fork Feather River, 24 mi NE of Oroville, 2002, 1171 m, *CPD 904*, (CAS). **Yuba:** on soil adjacent to small stream at historical site of Milk Ranch, three mi SE of Challenge, 2003, 2450 ft, *CPD 979* (CAS).

Aulacomnium androgynum (Hedwig) Schwägrichen

Abundant; on rotting wood in forests; also less common on soil or rock. Sporophytes uncommon, gemmae stalks common.

Butte: on rotting wood under dense forest canopy, 1.5 mi E of Brush Creek community, 2002, 2763 ft,

CPD 510 (CAS). **Plumas:** on rotting wood adjacent to Denten Creek, 1 mi E of Graeagle, 2004, 4700 ft, *CPD & Miller 1362* (CAS). **Sierra:** on rock face adjacent to tributary to Rock Creek at historic mining town of Union Hill, five mi S of LaPorte, 2005, 4042 ft, *CPD 1931* (CAS). **Yuba:** on roadside soils underneath forest canopy on access rd to Burnt Ridge Campground, five mi SE of Challenge, 2003, 2220 ft, *CPD 960* (CAS).

Aulacomnium palustre (Hedwig) Schwägrichen

Common; on wet boggy soils and saturated wood in fens, wet meadows, seeps and springs. Sporophytes and gemmae stalks uncommon.

Plumas: on saturated soil at wet meadow edge at Grassy Lake, Lakes Basin, six mi SW of Graeagle, 2001, 6320 ft, *CPD, Norris & Hanson 444*, (RMA); on rock in seep underneath mixed conifer forest in tributary to Rabbit Creek, 1 mi W of LaPorte, 2005, 4890 ft, *CPD & Toren 2029* (RMA); on moist soil at base of *Pinus contorta* stump at Little Summit Lake, 17 mi E of Quincy, 2005, 5856 ft, *CPD 2108* (RMA). **Sierra:** on wet peat soils in open meadow at McNair Meadow, 1.5 mi NW of Calpine, 2003, 1613 m, *CPD 901* (RMA).

Barbula convoluta Hedwig

Rare; on disturbed soil or charred wood with soil. Sporophytes present on both collections.

Plumas: on dry soil of roadside cutbank near South Fork of Long Valley Creek, four mi E of Cromberg, 2004, 5845 ft, *CPD 1598* (RMA). **Yuba:** on damp charred tree stump at ground level with soil mixed in substrate, five mi SE of Challenge, 2010, 2000 ft, *Toren 9737* (RMA).

Bartramia ithyphylla Bridel

Uncommon; on shaded soil and rock. Sporophytes common.

Sierra: on shaded soil over exposed root under forest canopy along Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2223* (RMA); on slate bedrock under 20% forest canopy in Cedar Grove Ravine, three mi E of LaPorte, 2005, 4745 ft, *CPD & Toren 2281* (RMA).

Blindia acuta (Hedwig) Bruch & Schimper

Uncommon; on wet seeping rock faces. Sporophytes uncommon.

Sierra: on wet seeping rock on stream bank of Gold Run Creek under dense forest canopy, five mi SW of LaPorte, 2005, 4100 ft, *CPD & Toren 1994* (UC); on moist vertical rock face at "Wink Eye Mine" under forest canopy along Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2229*; on slate bedrock under 20% forest canopy in Cedar Grove Ravine, three mi E of LaPorte, 2005, 4745 ft, *CPD & Toren 2283* (RMA).

Brachytheciastrum collinum (Schleicher ex Müller Hal.) Bruch & Schimper

Uncommon, on dry rock outcrops on E side of Plumas National Forest. No collections with sporophytes.

Plumas: on exposed volcanic conglomerate rock outcrop on ridge above Cascade Creek, 13 mi E of Quincy, 2005, 6625 ft, *CPD & Toren 2086* (UC); on dry volcanic conglomerate rock outcrop along lower Emigrant Creek, 15 mi E of Quincy, 2005, 5909 ft, *CPD 2105* (RMA); on granitic rock outcrop under forest canopy along Cold Stream, 2.5 mi S of Antelope Lake, 2005, 5799 ft, *CPD & Toren 2217* (RMA).

Brachytheciastrum leibergii (Grout) Ignatov & Huttunen
Uncommon; on moist wood, rocks or soil, often at margins of seeps, springs and creeks, also in upland sites, underneath moderate to dense forest canopy. Sporophytes common.

Butte: on rotten wood underneath dense forest canopy, six mi E of Brush Creek community, 2002, 3876 ft, *CPD & Gross 1055* (RMA). **Plumas:** on soil and over small rock under dense forest canopy, three mi E of Portola, 2002, 5240 ft, *CPD 578* (UC); on moist soil at margin of headwaters of Cascade Creek underneath dense forest canopy, 13 mi E of Quincy, 2005, 6472 ft, *CPD & Toren 2088* (RMA). **Sierra:** on organic moist soil under dense forest canopy along tributary to Potosi Creek, six mi NE of LaPorte, 2005, 5793 ft, *CPD & Toren 2306* (RMA).

Brachytheciastrum velutinum var. *velutinum* (Hedwig) Ignatov & Huttunen

Common; on tree bases, rotting wood, soil and rock and generally under forest canopy. Sporophytes common.

Butte: on exposed root near small creek underneath dense forest canopy, 1.5 mi W of Cresta, 2004, 3206 ft, *CPD & Toren 1752* (RMA). **Plumas:** on exposed root of *Abies concolor* underneath dense forest canopy, four mi W of Little Grass Valley Reservoir, 2002, 5240 ft, *CPD 781* (RMA, Harpel personal herbarium); shaded soil of streambank, 1984, 1200 m, adjacent to Hwy 89, three mi S of Crescent Mills, *Norris 69938* (UC). **Sierra:** on rotting wood on forest floor underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1857* (RMA); on moist soil at margin of Potosi Creek underneath dense forest canopy, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2240* (RMA).

Brachytheciastrum velutinum var. *salicinum* (Schimper) Ochtyra & Żarnowiec

Uncommon; on wood, soil and rock with sparse forest canopy. Sporophytes common.

Plumas: on wood in ephemeral stream channel of Denton Creek with sparse forest canopy, two mi N of Graeagle, 2004, 5389 ft, *CPD 1472* (RMA); on rock underneath sparse forest canopy along unnamed tributary to Willow Creek, three mi NE of Graeagle, 2004, 5191 ft, *CPD & Toren 1703* (RMA); base of *Abies concolor*, six mi SW of Quincy, 2001, 5400 ft, *CPD 425* (UC – this specimen originally identified as *B. fendleri*).

Note: I have followed Ignatov (2014) by including *Brachythecium venustum* (De Notaris) with *Brachytheciastrum velutinum* var. *salicinum*.

Brachythecium acutum (Mitten) Sullivant

Rare; saturated peat soils. Single collection without sporophytes.

Plumas: raised spring mound at Oldhouse Fen about 10 mi NW of Portola, 2007, 5860 ft, *CPD 2404*, *Toren 9589a* (CAS, determined by Ignatov).

Note: This species was recently determined as new to California, after *California Mosses* was published by Malcolm et al. (2009). There are several other collections in the Sierra Nevada Mountains, so this species is not considered new to California by this study alone (J. Shevock personal communication 2014).

Brachythecium albicans (Hedwig) Bruch & Schimper

Common; on rock, duff and soils in forest environments. No collections with sporophytes.

Butte: on rock in ephemeral drainage to Flea Creek, two mi NE of Concow Reservoir, 2004, 2919 ft, *CPD & Toren 1817* (RMA). **Plumas:** on exposed rock outcrop along Stag Creek, four mi NW of Little Grass Valley Reservoir, 2002, 1704 m, *CPD & Gross 910* (UC); on dry rock outcrop near Grizzly Lake, two mi SW of Bucks Lake, 2003, 5220 ft, *CPD, Heep & Toren 1149* (RMA); on dry duff on stream bank along Long Valley Creek, 20 mi E of Quincy, 2005, 6370 ft, *CPD & Toren 2168* (RMA). **Sierra:** on rock outcrop at Little Rock Creek and Rock Creek confluence, six mi S of LaPorte, 2005, 3800 ft, *CPD 1898* (RMA). **Yuba:** on soil of eroded stream bank underneath dense forest canopy along Simon Ravine, 5.5 mi SW of LaPorte, 2005, 4120 ft, *CPD 1968* (RMA).

Brachythecium asperillum (Mitten. ex Müller Hal.) Sullivant

Rare, in small seepy drainage in mixed conifer forest.

Plumas: along Deanes Valley Rd (24N28) at Deer Creek, four mi W of Quincy, 1998, 4100 ft, *Janeway 5639* (MO, determined by M. Ignatov).

Brachythecium bolanderi (Lesquereux) A. Jaeger

Rare; on soil. No sporophytes in single collection examined.

Butte: on rotten wood in shaded riparian zone, six mi S of Paradise, Lime Saddle Marina Access Rd, 2011, 930 ft, *CPD 2690* (CAS). **Plumas:** bottom of deep shady canyon along Soda Creek, 0.7 mi NW of Hwy 70, 1998, 3100 ft, *Janeway 5581* (MO, determined by M. Ignatov). **Yuba:** on moist bare soil about five mi SE of Challenge, 2010, 2000 ft, *Toren 9736* (RMA).

Brachythecium erythrorrhizon Schimper

Uncommon; on streamside rock or wood underneath forest canopy. Sierra County collection without sporophytes.

Plumas: on moist shaded log near intermittent stream, four mi S of Bucks Lake, 2009, 5575 ft, *Toren 9715* (CAS, determined by Ignatov); on dry soil over rock, W of Four Trees, four mi SE of Cresta, 2009, 4500 ft, *Toren 9722* (CAS). **Sierra:** on rock near Potosi Creek underneath dense forest canopy, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2236* (RMA).

Brachythecium frigidum (Müller Hal.) Beschereille

Abundant; on rocks, wood or soil in seeps, springs, wet meadows and creeks, in full sunlight to dense shade. Sporophytes uncommon.

Butte: in standing water on litter under dense forest canopy, two mi S of Brush Creek community, 2002, 937 m, *CPD 826* (CAS). **Plumas:** submerged in stream under forest canopy in tributary to Lone Rock Creek, two mi W of Antelope Lake, 2002, 1720 m, *CPD & Gross 694* (CAS, UC); on moist soil in seep under partial forest canopy, three mi E of Moonlight Peak and 10 mi NE of Greenville, 2005, 5803 ft, *CPD & Toren 2183* (CAS); in dense mat of mosses in wet meadow, open canopy with willow stringer along South Fork Long Valley Creek, five mi E of Cromberg, 2004, 6074 ft, *CPD 1581* (CAS); on wet rocks on edge of Berry Creek, three mi NE of Quincy, 2004, 3500 ft, *Clifton B278* (CAS). **Yuba:** in moss dominated spring feeding into tributary to Slate Creek, four mi SW of LaPorte, 2005, 4200 ft, *CPD 1971* (CAS).

Brachythecium salebrosum (Hoffman ex F. Weber & D. Mohr.) Schimper

Rare; on forest floor. No sporophytes on single collection.

Plumas: on saturated soils at edge of meadow, eight mi NW of Antelope Lake, 2002, 2082 m, *CPD 1085* (UC); on old shreds of bark on forest floor, S side of Marion Ravine, 1998, 4800 ft, *Janeway 5702* (MO, determined by M. Ignatov).

Note: *Brachythecium salebrosum* is expected to be a forest floor species. Because *CPD 1085* was collected in a fen, it may instead be *B. mildeanum* (Schimp.) Schimp., an easily confused similar looking species. It should be reexamined.

Bruchia bolanderi Lesquereux

Uncommon; on seeping clay soils, in partial shade to full sunlight. Sporophytes rare.

Plumas: on moist soil bank of creek in Onion Valley, nine mi NE of LaPorte, 2001, 6221 ft, *Hanson 442* (RMA) and *Norris 83175* (UC); on clay soils at edge of seasonal drainage and near fen at Tamarack Flat, seven mi SW of Quincy, 2001, 5400 ft, *CPD, Hanson & Norris 399* (RMA, UC); on soils in permanent seep on road cut, eight mi SW of Quincy, 2001, 5380 ft, *CPD & Dittes 419* (UC); on seeping clay soil bank on down cut margin of Little Grizzly Creek, 16 mi E of Quincy, 2005, 5829 ft, *CPD & Friend 2179* (RMA); on wet clay bank where cattle hooves had scraped vascular plants away previous year in headwaters of Fall River, two mi W of Little Grass Valley Reservoir, 2002, 1685 m, *CPD 647* (UC).

Note: The Onion Valley site was the only collection with sporophytes, and is the only undisputable collection of the species in the study area. Norris, Toren, and the author believe that the sterile specimens are recognizable, but this is not a universal belief and this author is not certain of the identification. Other bryologists (personal communication B. Allen 2003 and Harpel 2004) have said the sterile specimens are unnamable.

Bryum argenteum Hedwig

Common; on concrete, dry rocks, disturbed soil, in urban areas in cracks in pavement; usually in full sun. Sporophytes uncommon.

Butte: on large granitic rock outcrop with sparse forest canopy, 1.5 mi W of Cresta, 2004, 3036 ft, *CPD & Toren 1729* (RMA); on moist granite rock underneath open forest canopy, at end of dirt rd from Shady Rest Area, 1 mi E of Cresta, 2006, 1700 ft, *CPD 2347* (RMA). **Plumas:** on crack in sidewalk in downtown Quincy, 2010, 3500 ft, *CPD 2654* (RMA); on mortar and rock around buildings in town of Storrie, 7.4 mi SW of Belden, 2011, 1771 ft, *CPD 2674* (CAS); on mortar and rock work in Feather River Canyon, 2.5 mi E of Belden, 2011, 2640 ft, *CPD 2662* (CAS, CHSC); around groups of rocks, N side of Last Chance Creek, 36 mi E of Quincy, 1998, 5880 ft, *Janeway 5677* (MO).

Bryum calobryoides J.R. Spence

Rare; on rock. Sporophytes unknown from county.

Plumas: on volcanic conglomerate rock outcrop with lime deposits on ridge above Jackson Creek, 1.5 mi SE of Cromberg, 2004, 5144 ft, *CPD 1689* (Spence personal herbarium, RMA); on exposed north-facing rock with snowmelt runoff, W of Onion Valley and nine mi NE of LaPorte, 2007, 6200 ft, *Toren 9600* (Spence personal herbarium).

Bryum lanatum (P. Beauvois) Bridel

Rare; in cracks in pavement, in full sun. Single collection without sporophytes.

Plumas: on crack in sidewalk in downtown Quincy, 2008, 3500 ft, *CPD 2441* (RMA).

Bucklandiella affinis (Schleicher ex F. Weber & D. Mohr) Bednarek-Ochyra & Ochyra

[*Racomitrium affine* (Schleicher ex F. Weber & D. Mohr) Lindberg]

Common; found on ephemerally moist soil or rock, sometimes seasonally submerged. Sporophytes common. **Butte:** on periodically moist granite slab at Big Bald Rock, three mi S of town of Brush Creek, 2003, 3270 ft, *Toren 9325* (CAS). **Plumas:** growing on rocky soil in dry intermittent draw, 12 mi NW of Quincy, 2002, 1585 M, *CPD & Gross 887* (UC, CAS). **Sierra:** on damp rock above Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2244* (CAS). **Yuba:** on rock adjacent to Dry Creek, 1 mi S of Challenge, 2003, 2427 ft, *CPD 1207* (CAS).

Bucklandiella heterosticha (Hedwig) Bednarek-Ochyra & Ochyra

[*Racomitrium heterostichum* (Hedwig) Bridel]

Occasional on dry upland rocks and soil. Sporophytes uncommon.

Butte: on soil under forest canopy on ridge top near town of Brush Creek, 2002, 3234 ft, *CPD & Gross 540* (KRAM); on granite rock near town of Brush Creek, 2002, 2660 ft, *CPD 843* (CAS). **Plumas:** on rock outcrop along Tollgate Creek, four mi NE of Quincy, 2004, 4369 ft, *CPD 1401* (UC, KRAM, determined by Bednarek-Ochyra). **Yuba:** on open rock outcrop on cliff 2.5 mi E of Strawberry Valley and 27 mi E of Oroville, 2005, 3335 ft, *CPD 1954* (RMA).

Bucklandiella obesa (Frisvoll) Bednarek-Ochyra & Ochyra

[*Racomitrium obesum* Frisvoll]

Common; found on rock. Sporophytes common. **Butte:** on rock adjacent to Lockerman Creek, 19 mi E of Chico, 2004, 3140 ft, *CPD & Toren 1792* (CAS). **Plumas:** growing on granite rock, 12 mi NW of Quincy, 2002, 4000 ft, *CPD & Gross 895* (UC, CAS). **Sierra:** on rock near Gibson Creek, 5.5 mi northeast of LaPorte, 2005, 5608 ft, *CPD & Toren 2256* (KRAM); on rock at margin of Little Rock Creek, six mi S of LaPorte, 2005, 3800 ft, *CPD 1896* (CAS, KRAM, determined by Bednarek-Ochyra).

Bucklandiella pacifica (Ireland & J.R. Spence) Bednarek-Ochyra & Ochyra

Rare; on soil and rock. Specimens not examined for presence of sporophytes.

Butte: on shallow soil on granite rock above Lockerman Creek, 19 mi E of Chico, 2006, 3150 ft, *Toren 9482A* (CAS). **Yuba:** on shaded, intermittently seepy rock face at the E side of Slate Creek Bridge, two mi E of Strawberry Valley, 2006, 950 m, *Toren 9497* (CAS).

**Buxbaumia viridis* (De Candolle) Mougeot & Nestler
Rare; on rotten, moist old-growth log in old-growth forest. Considerable effort has been expended surveying for this species, therefore, the rare status is stronger than for some other species listed as rare in this catalogue. Sporophytes present on both collections.

Plumas: on rotten, wet, old-growth conifer log adjacent to French Creek, 1 mi N of Sly Creek Reservoir and

eight mi SW of LaPorte, 2009, 2980 ft, *CPD & Toren 2605* (CAS). **Yuba**: on rotten, barkless old-growth conifer log, one end in Brush Creek and in spray zone at bottom of perennial, 20-ft tall cascading waterfall, 2.5 mi E of Strawberry Valley, 2005, 3400 ft, *CPD 1948* (RMA, UC).

Campyllum chrysophyllum (Bridel) Lange.

Rare; on saturated wood in fen. Single collection without sporophytes.

Plumas: on log at edge of Silver Lake fen, 10 mi W of Quincy, 2001, 5900 ft, *CPD, Hanson & Norris 432* (RMA).

Note: Determined in 2001 by Norris and verified in 2009 by Toren and Dillingham, however the plant was collected in a fen, which appears to be somewhat inconsistent with typical habitats where the species is normally found.

Campyllum polygamum (Schimper) C.E.O. Jensen

Rare; on saturated soils in fen-like wetlands. No collections with sporophytes.

Plumas: on floating mat at Fowler Lake, three mi N of Little Grass Valley Reservoir, 2001, 5480 ft, *CPD, Hanson & Norris 412* (RMA); on saturated soils in fen-like wetland in full sunlight at headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6907 ft, *CPD & Toren 1663* (UC) and *CPD & Toren 1670* (CAS); floating in pond in Gray Eagle Valley, 1900, 6500 ft, *Leiberg 5468* (NY).

Note: *Leiberg 5468* was annotated as isotype of *Campyllum polygamum* var. *fluitans* by L. Hedenäs, 1995.

Campyllum stellatum (Hedwig) C.E.O. Jensen

Rare; in rich fen. No sporophytes on single collection.

Plumas: on spring mound in fen with pH of 8.3, named Alkali Fen, Last Chance Creek, seven mi N from Frenchman Lake, 2007, *Bishop s.n. 28 Aug 2007* (RMA).

**Campylopus introflexus* (Hedwig) Bridel

Rare: on disturbed soils. Single collection without sporophytes.

Yuba: on gravelly road shoulder, five mi SE of Challenge, 2010, 2000 ft, *Toren 9735* (CAS).

Note: this is thought to be an introduced species in the study area (Carter 2014a).

**Campylopus pyriformis* (Schultz) Bridel

Rare: on disturbed soils. Single collection without sporophytes.

Plumas: on mineral soil in spring with high sulfur content, eight mi NW of Quincy, 2011, 2840 ft, *CPD 2659* (CAS).

Note: This specimen, new for the Sierra Nevada Mountains, was determined by D. Toren and verified by J. Brinda and C. Dillingham in 2011. This species was recently excluded from California (Frahm 2007), but is included in other studies of California bryophytes (Norris and Shevock 2004a; Malcolm et al. 2009).

Ceratodon purpureus (Hedwig) Bridel

Abundant; on soil and soil over rock or wood, often in disturbed sites, and sites usually are dry in the summer. Sporophytes common.

Butte: on decomposed granitic soils underneath sparse forest canopy, 1.5 mi W of Cresta, 2004, 3036 ft, *CPD & Toren 1746* (RMA); on dry soil in 30-year-old *Pinus ponderosa* plantation 20 mi NE of Oroville, 2002, 1250 m, *CPD & Gross 1057* (UC). **Plumas**: on soil at trail

junction near Gold Lake in Bucks Lake Wilderness, 2001, 5819 ft, *CPD, Hanson & Norris 439* (CAS); on disturbed soil in grassy opening underneath sparse forest canopy, six mi E of Quincy, 2004, 3810 ft, *CPD 1259* (CAS). **Sierra**: on rock near stream at "Wink Eye Mine" underneath dense forest canopy along Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2235* (CAS). **Yuba**: on roadside soils underneath moderate forest canopy, five mi SE of Challenge, 2003, 2220 ft, *CPD 961* (UC).

Claopodium bolanderi Best

Common on W side of study area; on soil, rock, wood and tree bases; underneath dense forest canopy. Sporophytes uncommon.

Butte: on soil at margin of Lockerman Creek, two mi NW of Cresta, 2004, 3140 ft, *CPD & Toren 1782* (CAS). **Plumas**: on rock above stream bank underneath moderate forest canopy, eight mi W of Quincy, 2002, 3980 ft, *CPD & Gross 896* (UC). **Sierra**: on silty soils underneath dense forest canopy near Gibson Creek, 5.5 mi NE of LaPorte, 2005, 5608 ft, *CPD & Toren 2260* (CAS). **Yuba**: on base of *Alnus rhombifolia* underneath dense forest canopy, five mi SW of LaPorte, 2005, 4060 ft, *CPD & Toren 1981* (CAS); on moist clay soil on bank of tributary stream to Slate Creek, 2.5 mi SE of Strawberry Valley, 2005, 3600 ft, *CPD 1926* (UC).

Claopodium crispifolium (Hooker) Renauld & Cardot

Rare on W side of study area; on wood under forest canopy. No sporophytes on single collection.

Sierra: on understory *Corylus* branch underneath 25% forest canopy adjacent to Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD 1874* (RMA).

Claopodium whippleanum (Sullivant) Renauld & Cardot
Common on W side of study area; on soil and creek banks; underneath dense forest canopy. No collections with sporophytes.

Butte: on soil adjacent to ephemeral tributary stream to Sucker Run Creek, four mi N of Forbestown, 2003, 2780 ft, *CPD 1398* (CAS, Harpel personal herbarium).

Plumas: on soil on bank of Rabbit Creek underneath dense forest canopy, 1/4 mi W of LaPorte, 2005, 4980 ft, *CPD & Toren 2025* (CAS). **Yuba**: on soil at edge of creek underneath dense forest canopy, three mi SE of Challenge, 2003, 2350 ft, *CPD 992* (CAS).

Codriophorus acicularis (Hedwig) P. Beauvois
[*Racomitrium aciculare* (Hedwig) Bridel]

Common; generally found in mesic situations and most often seasonally submerged rocks or soil along intermittent or permanent creeks. Sporophytes uncommon. **Butte**: mesic riparian zone, near town of Brush Creek, 2002, 3272 ft, *CPD 542* (UC). **Plumas**: growing on ephemerally submerged rocks in small creek, 1 mi W of Little Grass Valley Reservoir, 33 mi NE of Oroville, 2002, 1686 M, *CPD 906* (CAS, UC). **Sierra**: on rock in splash zone of Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2243* (CAS). **Yuba**: on rock adjacent to Dry Creek, 1 mi S of Challenge, 2003, 2427 ft, *CPD 1206* (CAS).

Codriophorus depressus (Lesquereux) Bednarek-Ochyra & Ochyra
[*Racomitrium depressum* Lesquereux]

Common; found in mesic riparian zones, generally on ephemerally submerged rocks in stream channels. Sporophytes common. **Plumas**: in periodically inundated stream bed of Long Valley Creek, four mi E of

Cromberg, 2004, 5845 ft, *CPD 1573* (KRAM). **Sierra:** on damp rock above Potosi Creek, six mi E of LaPorte, 2005, 5438 ft, *CPD & Toren 2250* (CAS).

Cratoneuron filicinum (Hedwig) Spruce

Uncommon; on saturated soils in springs, wet meadows and fens at higher elevations. Sporophytes uncommon.

Plumas: on saturated soils at margin of creek flowing through meadow at Grassy Lake, Lakes Basin, six mi SW of Graeagle, 2001, 6320 ft, *CPD, Hanson & Norris 406* (CAS); at Johnsville, 1934, Ikenberry 1352 (MO); on exposed *Ahnus incana* roots at edge of spring-fed headwater stream of Taylor Creek, nine mi NE of Quincy, 2004, 6826 ft, *CPD & Toren 1833* (CAS); on saturated soils in fen-like wetland at headwaters of Taylor Creek in full sunlight, nine mi NE of Quincy, 2004, 6907 ft, *CPD & Toren 1662* (CAS); on moist soil adjacent to spring-fed tributary to Long Valley Creek, 19 mi E of Quincy, 2005, 6196 ft, *CPD & Toren 2162* (CAS); on moist soil at edge of spring under dense forest canopy, three mi NE of Graeagle, 2004, 5050 ft, *CPD & Toren 1707* (CAS).

Crumia latifolia (Kindberg) W.B. Schofield

Rare; on wet, calcareous rocks or submerged in creeks. No collections with sporophytes.

Plumas: on ephemerally submerged sandstone bedrock in tributary to Middle Fork Feather River underneath open forest canopy, 2004, 4696 ft, *CPD & Toren 1720* (UC); on rock in calcareous seep on margin of Caribou Powerhouse Rd, 15 mi NW of Quincy, 2006, 3000 ft, *CPD, Kellman & Shevock 2354* (RMA).

Dendroalsia abietina (Hooker) E. Britton ex Brotherus
Abundant; on the bark of trees, usually hardwood, and on rock; underneath moderate to dense forest canopy or shaded rock recesses. Sporophytes common.

Butte: on recently fallen tree in Little Ram Creek, 1.5 mi N of Brush Creek community, 2002, 2920 ft, *CPD & Gross 1180* (CAS). **Plumas:** on shaded recess of rock boulder adjacent to unnamed tributary to Clear Creek, seven mi N of Quincy, 2004, 4780 ft, *CPD 1412* (CAS); on *Quercus kelloggii* adjacent to tributary to Taylor Creek, five mi NE of Quincy, 2004, 4329 ft, *CPD 1314* (CAS). **Sierra:** on bark of fallen *Acer macrophyllum* underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1891* (CAS). **Yuba:** on *Lithocarpus densiflorus* bole underneath dense forest canopy, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1202* (CAS).

Dichodontium pellucidum (Hedwig) Schimper

Common; on seasonally submerged rocks along creeks and seeps; and uncommonly on wood. Sporophytes uncommon.

Butte: on saturated rock at edge of stream, two mi NW of Forbestown, 2003, 2070 ft, *CPD 1022* (RMA). **Plumas:** on log in stream, eight mi W of Quincy, 2002, 4000 ft, *CPD & Gross 892* (UC); on wet rock in headwaters of Dolly Creek, 16 mi E of Quincy, 2005, 6272 ft, *CPD, Toren & Friend 2050* (RMA); on rocks in deep shade near stream, Quincy, 1934, 3500 ft, Ikenberry 1015 (MO). **Sierra:** on saturated rock at edge of tributary to Rock Creek, five mi S of LaPorte, 2005, 4042 ft, *CPD 1932* (RMA). **Yuba:** on rock underneath 4-foot-tall waterfall in tributary to Canyon Creek, 3.5 mi E of Strawberry Valley, 2005, 3660 ft, *CPD 1911* (RMA).

Note: I have followed Eckel (2007) and have included *Dichodontium flavescens* (Dickson ex Withering) Lindberg with *Dichodontium pellucidum* for this work.

Dicranella rufescens (Withering) Schimper

Uncommon, on moist soil bank underneath partial forest canopy. Sporophytes common.

Plumas: on cutbank of near-vertical moist soil bank underneath partial shade of forest, 0.1 mi S of Bucks Lake, 2003, 5200 ft, *CPD & Toren 1134* (RMA); on soil bank underneath moderate forest canopy, two mi W of Little Grass Valley Reservoir, 2002, 1734 m, *CPD & Gross 813* (UC). **Sierra:** on moist vertical clay soils on eroded creek bank underneath sparse forest canopy, five mi NE of LaPorte, 2005, 5360 ft, *CPD & Toren 2262* (RMA).

Dicranoweisia cirrata (Hedwig) Lindberg ex Milde

Abundant; on dead wood and on the bases of conifers. Sporophytes common.

Butte: on cedar log underneath dense forest canopy, two mi W of Brush Creek, 2002, 2981 ft, *CPD 512* (UC). **Plumas:** on charred log along North Fork Feather River, 1947, Koch 1873 (UC); on rotting wood in riparian zone of Denten Creek, 1 mi NE of Graeagle, 2004, 4720 ft, *CPD & Miller 1369* (CAS). **Sierra:** on base of *Calocedrus decurrens* underneath dense forest canopy, five mi NE of LaPorte, 2005, 5240 ft, *CPD 2267* (CAS). **Yuba:** on base of *Pseudotsuga menziesii* underneath dense forest canopy, six mi SE of Challenge, 2003, 2740 ft, *CPD 949* (CAS).

Dicranoweisia crispula (Hedwig) Milde

Common; on either dry or wet rock underneath sparse to dense forest canopy. Sporophytes common.

Butte: on saturated rock in splash zone of tributary to Lake Oroville, two mi WNW of Forbestown, 2003, 2320 ft, *CPD 932* (UC). **Plumas:** on dry rock outcrop near edge of Fowler Lake, three mi N of Little Grass Valley Reservoir, 2001, 5480 ft, *CPD, Hanson & Norris 411* (CAS); on dry rock outcrop, five mi SW of Bucks Lake, 2003, 5188 ft, *CPD & Toren 1236* (CAS); on metamorphic rock, 1 mi W of LaPorte, 2005, 5369 ft, *CPD & Toren 2021* (CAS).

Note: I have followed Schofield (2007) and have included *D. contermina* Renauld & Cardot with *D. crispula* for this work.

* *Dicranum howellii* Renauld & Cardot

Uncommon; thus far found only on rock under dense canopy. Sporophytes unknown from study area. **Butte:** on dry rock under 90% canopy, 2.5 mi NE of Forbestown, 2003, 2700 ft, *CPD 1011* (CAS, MO, UC); on steep northwest-facing slope of large rock talus, on arm of Lake Oroville near Bloomer Hill, 2003, 290 M, Janeway 7745 (CHSC, UC). **Plumas:** on dry rock under forest canopy near Onion Creek, five mi NE of Strawberry Valley, 2005, 4225 ft, *CPD 2004* (CAS, UC).

Didymodon brachyphyllus (Sullivant) R.H. Zander

Rare, on rock. Sporophytes absent on single collection.

Plumas: on dry rock outcrop underneath sparse forest canopy, 2.5 mi NW of Graeagle, 2004, 5048 ft, *CPD 1491A* (MO, determined by Zander).

* *Didymodon eckeliae* R.H. Zander

Rare, from rock and concrete. Sporophytes absent on single collection examined.

Plumas: on vertical rock wall of open serpentine slope, along Caribou Rd, 3.3 mi E from Hwy 70, 2006, 2550 ft, *Shevock 28904* (CAS). **Yuba:** on sunny concrete water tank of old abandoned campground, five mi S of Challenge, 2010, 2300 ft, *Toren 9745* (MO).

Didymodon insulanus (De Notaris) M.O. Hill
[*Didymodon vinealis* var. *flaccidus* (Bruch & W.P. Schimper.) R.H. Zander]

Rare; on rock. No sporophytes on one collection examined.

Plumas: on saturated rock in stream channel of Denten Creek, 1.5 mi E of Graeagle, 2004, 5100 ft, *CPD 1374* (RMA); on rocks in Dixie Creek, 0.6 mi from Hwy 89, 1997, *Shevock, Ertter & Morosco 15729* (CAS).

Didymodon nicholsonii Culmann

Uncommon; on wet or dry rock. Sporophytes common. **Butte:** on thin soils shaded by rocks along ravine draining to North Fork Feather River Canyon at Rich Bar, 1998, 2750 ft, *Janeway 5420* (MO); rocky open serpentine slope, 3.3 mi up Caribou Rd from Hwy 70, 2006, 2550 ft, *Shevock 28904* (CAS).

Didymodon norristii R.H. Zander

Locally common on E side of study area; on rock in ephemeral drainage zones in full sun. Sporophytes uncommon.

Plumas: on bedrock in ephemerally submerged portion of Denten Creek, 1.5 mi E of Graeagle, 2004, 5100 ft, *CPD & Miller 1373* (CAS); on volcanic conglomerate rock on S facing slope, three mi W of Cromberg, 2007, 4040 ft, *CPD & Toren 2386* (UC); on volcanic conglomerate rock outcrop in full sun, 16 mi E of Quincy, 2005, 6476 ft, *CPD & Toren 2156* (CAS); on vertical rock outcrop in sheet drainage area underneath sparse forest canopy, two mi N of Graeagle, 2004, 5048 ft, *CPD 1487* (MO).

Didymodon rigidulus Hedwig

Rare, on rock. Sporophytes absent on both collections. **Plumas:** on bedrock along ephemeral tributary to Greenhorn Creek, seven mi E of Quincy, 2004, 4040 ft, *CPD 1387* (CAS); on dry rock outcrop underneath sparse forest canopy, 2.5 mi NW of Graeagle, 2004, 5048 ft, *CPD 1491* (RMA).

Note: Both collections have rhizoidal clusters on adaxial side of leaf apex, which in Norris and Shevock (2004b) keys to *D. nicholsonii*. Zander, however, named these collections as *D. rigidulus*.

Didymodon tophaceus (Bridel) Lisa

Rare, on rock. Sporophytes absent on both collections. **Plumas:** on serpentine bedrock along unnamed spring in Feather River Canyon, 4.5 mi E of Belden, 2011, 2450 ft, *CPD 2661* (MO, determined by Zander); on travertine rock in spring, 1 mi W of Belden, 2011, 2223 ft, *CPD 2663* (CAS, determined by Brinda); on calcium influenced spring in Feather River Canyon, five mi E of Belden, 2011, 2627 ft, *CPD 2710* (CAS, determined by Slack).

Didymodon vinealis (Bridel) R.H. Zander

Common; on wet or dry rock or soil in full sun or underneath dense forest canopy. Sporophytes uncommon.

Butte: on wet crack in granite outcrop, two mi N of Brush Creek community, 2002, 2811 ft, *CPD 545* (UC); on vertical rock wall in pockets of collected soil adjacent to perennial creek, two mi NW of Forbestown, 2003,

1588 ft, *CPD 1093* (MO). **Plumas:** on wet rock in splash zone of 4-foot-tall waterfall along tributary to Cashman Creek, seven mi NE of Quincy, 2004, 5906 ft, *CPD 1422* (CAS). **Sierra:** on rock in splash zone of Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD 1885* (CAS).

Note: The species is variable within the study area. Zander has included specimens with bistratose margins (*CPD 1093*) and others with rhizoids growing from the costa in older leaves (*CPD 1408*, *CPD 1506* & *CPD 1510* [all at MO]) in his concept of *D. vinealis* from the study area.

Didymodon vinealis var. *rubiginosus* (Mitt.) R.H. Zander
Rare; no details on substrate on collection. Sporophytes present on only collection.

Plumas: at Indian Falls along Indian Creek, eight mi N of Quincy, 1955, 3200 ft, *Lawton 3133* (MO, determined by Lawton as synonym *Barbula rubiginosa* Mitt.).

Note: In Norris and Shevock (2004a) this species is listed as *D. occidentalis* R.H. Zander.

Ditrichum ambiguum Best

Rare; on soil. Sporophytes present on single collection. **Butte:** on decomposed granitic soils on roadside cutbank underneath moderate forest canopy, 2.5 mi N of Pulga, 2004, 2941 ft, *CPD & Toren 1820* (UC).

Ditrichum heteromallum (Hedwig) E. Britton

Rare; on soil. Sporophytes unknown.

Yuba: on shaded damp bare soil on roadcut, North slope of Poverty Hill above Slate Creek, 2005, 4600 ft, *Toren 9414* (CAS).

Ditrichum montanum Leiberg

Uncommon; on soil. Sporophytes present on all collections.

Butte: on disturbed granitic soils of old roadbed in shade, three mi W of Cresta, 2005, 3500 ft, *Toren 9410* (RMA). **Plumas:** on dry soil at edge of stream in headwaters of Stag Creek, four mi NW of Little Grass Valley Reservoir, 2002, 5680 ft, *CPD & Gross 1242* (RMA, UC). **Yuba:** on damp clay soil, five mi SE of Challenge, 2010, 2140 ft, *Toren 9757* (RMA).

Ditrichum schimperi (Lesquereux) Kuntze

Rare; on soil. Sporophytes present on both collections. **Butte:** on soil at Big Bald Rock, 15 mi NE of Oroville, 2005, 3200 ft, *Toren 9412* (RMA); on bare soil underneath sparse forest canopy, two mi E of Magalia, 2005, 3000 ft, *Toren, Hillaire & Lewis 9413* (RMA). **Yuba:** in old abandoned campground, five mi S of Challenge, 2010, 2300 ft, *Toren 9749* (CAS).

Drepanocladus aduncus (Hedwig) Warnstorf

Common; at higher elevations as a free floating aquatic or in saturated soils of fens, wet meadows, floating mats, ponds, springs and streams. No collections with sporophytes.

Plumas: on soil in wet meadow, seven mi N of Antelope Lake, 2001, 2047 m, *CPD 394* (CAS, Harpel personal herbarium); on floating mat at Fowler Lake, three mi N of Little Grass Valley Reservoir, 2001, 5480 ft *CPD, Hanson & Norris 413* (CAS); on saturated soil in Guest Fen, 14 mi SW of Quincy, 2003, 5080 ft, *Bishop 006* (CAS); on saturated soil in meadow, five mi N of Antelope Lake, 2002, 6600 ft, *CPD 1077* (CAS); submerged in small pond in meadow 1/2 mi W of Lake Davis, eight mi N of Portola, 2007, 5800 ft, *CPD 2392*

(CAS). **Sierra:** on saturated peat soils in McNair Meadow, three mi W of Calpine, 2003, 1613 m, *CPD* 902 (CAS, Harpel personal herbarium).

Drepanocladus polycarpon (Blandow ex Voit) Warnstorf
Uncommon at higher elevations; on peat soils or wood in fens and springs. No collections with sporophytes.

Plumas: on saturated soil in wet seep, eight mi NW of Antelope lake, 2002, 2047 m, *CPD* 1079 (RMA); on moist soil at edge of spring, three mi NE of Graeagle, 2004, 5050 ft, *CPD* & *Toren* 1696 (RMA); on saturated soils in fen-like wetland at the headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6907 ft, *CPD* & *Toren* 1665 (RMA); on saturated wood in fen-like wetland at Blakeless Spring, 15 mi E of Quincy, 2005, 6414 ft, *CPD* & *Toren* 2152 (RMA); on saturated soils in fen, 14 mi SW of Quincy, 2003, 5080 ft, *Bishop* 009 (CAS).

Note: Hedenäs (2014) did not discuss *D. polycarpon* in his treatment of North American species, but did include a discussion of *D. polycarpus*, which he included in his species concept of *D. aduncus* that may be relevant. I have chosen to follow Norris and Shevock (2004a, b) and recognize *D. polycarpon* at the species level due to the difference in the alar region between *D. polycarpon* and *D. aduncus*. Note that in Norris and Shevock (2004a, b) the taxon is misspelled as *D. polycarpus* (Shevock personal communication 2015). I follow the spelling listed in the Tropicos database.

Drepanocladus sordidus (Müller Hal.) Hedenäs

Uncommon at higher elevations; on peat soils or wood in fens and springs. No collections with sporophytes.

Plumas: on saturated soils in wet meadow along Willow Creek, downstream from Willow Lake, nine mi NE of Chester, 2000, 5800 ft, *Corbin* 971 (CAS, Lassen NF herbarium); on peat soils in Oldhouse Fen, 10 mi NW of Portola, 2007, 5860 ft, *CPD*, *Toren* & *Bishop* 2403 (CAS, Janssens personal herbarium).

Note: identification has been problematic and specimens have previously been determined as other species including: *Drepanocladus aduncus* (Hedwig) Warnstorf (*CPD* 1079) and *Scorpidium scorpioides* (Hedwig) Limpricht (*Corbin* 971).

Encalypta ciliata Hedwig

Rare; on soil in rock crevice. Both collections with sporophytes.

Plumas: on soil in rock crevices above creek in Clarks Ravine, three mi S of LaPorte, 2005, 4700 ft, *Toren* s.n. (CHSC 110675); on soil on rocky cutbank in Feather River Canyon, 2.4 mi SW of Belden, 2011, 2116 ft, *Slack*, *Toren* & *Dillingham* 2667 (CAS).

Encalypta rhaptocarpa Schwägrichen

Rare; on soil. Sporophytes common.

Plumas: Hwy 89 about three mi S of Crescent Mills, *Norris* 69961 (determined by Horton); on dry granitic rock face on roadside cut underneath sparse forest canopy, five mi S of Antelope Lake and 13 mi SE of Janesville, 2005, 4677 ft, *CPD* & *Toren* 2199 (RMA).

Encalypta vulgaris Hedwig

Rare; on rock. Sporophytes present on single collection.

Plumas: on vertical, dry rock outcrop, 2.5 mi NW of Graeagle, 2004, 5048 ft, *CPD* 1490 (UC).

**Entosthodon attenuatus* (Dickson) Bryhn

Rare; on moist soil. Sporophytes on single collection.

Yuba: on moist soil, two mi S of La Porte Rd near Woodleaf, 2005, 2800 ft, *Toren* 9411 (CAS). Specimen had claret-colored rhizoids, which are unique to Northern Hemisphere *Entosthodon* species.

Note: This collection was determined with molecular work by Goffinet.

Epipterygium tozeri (Greville) Lindberg

Uncommon; on moist soil under dense forest canopy. Sporophytes uncommon.

Butte: on moist granitic soil along tributary to Jack Creek, two mi NE of Brush Creek community, 2003, 2920 ft, *CPD* 805 (UC, MO); on soil in splash zone of small 3-foot-tall waterfall along unnamed tributary to Lake Oroville, two mi NW of Forbestown, 2003, *CPD* 936 (UC). **Yuba:** on moist soil under dense forest canopy three mi SE of Challenge, 2003, 2350 ft, *CPD* 988 (UC, CAS).

Eucladium verticillatum (Withering) Bruch & Schimper

Rare; on moist calcareous rocks. Sporophytes present on one of two collections reviewed.

Plumas: on seepy limestone rock, along Hwy 70 near Belden, 1984, 4265 ft, *Norris* 69977 (UC); on rock in seep with calcium deposits, along North Fork Feather River Trail upriver from Caribou Powerhouse, 15 mi NW of Quincy, 2006, 3000 ft, *CPD* & *Miller* 2342 (CAS) and further up same trail in similar habitat *CPD* & *Miller* 2343 (CAS).

Eurhynchium pulchellum (Hedwig) Jennings

Common at moderate to higher elevations; on soil or soil over rock underneath moderate to dense forest canopy. Sporophytes uncommon.

Plumas: on dry rock outcrop, two mi SW of Bucks Lake, 2003, 5220 ft, *CPD*, *Toren* & *Heep* 1150 (CAS); on moist soil at edge of tributary to Cascade Creek, 13 mi E of Quincy, 2005, 6253 ft, *CPD* & *Toren* 2082 (CAS). **Sierra:** on moist organic soil on stream bank of Gold Run Creek, five mi SW of LaPorte, 2005, 4100 ft, *CPD* & *Toren* 1992 (CAS); on clay soil at margin of tributary to Gold Run Creek, five mi SW of LaPorte, 2005, 4570 ft, *CPD* & *Toren* 2000 (UC); on moist soil under dense forest canopy along Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD* & *Toren* 2239 (CAS).

Fabronia pusilla Raddi

Rare; single collection on bark of oak.

Butte: on trunk of *Quercus wislizenii* in full shade near Elephant Dome, Feather River Canyon, 2011, 1550 ft, *Wishner* 12281 (RMA).

Fissidens bryioides Hedwig

Common; mostly on wet soil (especially clay) and also occasionally on saturated wood or rocks in stream channel, usually shaded. Sporophytes uncommon.

Butte: on saturated wood in tributary to Berry Creek, two mi S of Brush Creek community, 2002, 834 m, *CPD* & *Gross* 831 (UC); on wet soil in splash zone of unnamed tributary to Lake Oroville, two mi WNW of Forbestown, 2003, 2320 ft, *CPD* 938 (RMA). **Plumas:** on moist clay soils on margin of tributary to Spanish Creek, 1 mi W of Keddle, 2004, *CPD* 1682 (CHSC). **Sierra:** on moist mineral soils in tributary to Slate Creek, 2.5 mi NE of LaPorte, 2005, 5080 ft (highest elevation collection for *Fissidens* on Plumas NF), *CPD* 2311 (RMA). **Yuba:** on moist clay soil in headwaters of Little Oregon Creek, two mi S of Challenge, 2003, 2660 ft, *CPD* 999 (UC).

Fissidens crispus Montagne

Common; on moist shaded soil and rocks of creeks and road banks. Sporophytes uncommon.

Butte: on moist soil adjacent to Ram Creek, two mi NE of Brush Creek community, 2002, 2980 ft, *CPD & Gross 1161* (UC). **Plumas:** on bank of tributary to Meadow Valley Creek, eight mi E of Quincy, 2002, 4020 ft, *CPD & Gross 665* (UC); on creek bank E of Concow, 1999, 2840 ft, *Janeway 6440* (CHSC, MO) (determined by Whittemore as synonym *F. limbatus*). **Yuba:** on ephemeral moist clay soils under dense canopy, 1/4 mi W of new Bullards Bar Reservoir and five mi SE of Challenge, 2003, 2500 ft, *CPD 955* (UC).

Fissidens grandifrons Bridel

Rare; on rock, submerged in creeks and springs. Kellman (2003) indicates usually, but not always calcareous. Sporophytes unknown from study area.

Plumas: on rock in cascading creek immediately W of Caribou Powerhouse, 15 mi NW of Quincy, 2006, 3000 ft, *CPD, Shevock & Kellman 2353* (CHSC, UC); on rock in spring uphill from North Fork Campground, 16 mi W of Quincy, 2009, 3133 ft, *Friend s.n. 31 Oct 2009* (CAS); at campsite along Hwy on North Fork Feather River, 1947, *Koch 1893* (MO).

**Fissidens pauperculus* M. Howe

Rare; on moist streamside soils under dense canopy. Sporophytes unknown from county.

Butte: on moist clay soils adjacent to tributary to Ponderosa Reservoir, 1.5 mi NW of Forbestown, 2003, 2620 ft, *CPD 929* (CAS); on clay stream bank near Watson Ridge, four mi ESE of Brush Creek community, 2002, 3360 ft, *CPD & Gross 779* (Harpel personal herbarium, UC).

Fissidens sublimbatus Grout

Uncommon, poor soils that dry in summer. Sporophytes common.

Butte: on ultramafic clay soils with 5% canopy of *Pinus sabiniana* and *Ceanothus cuneatus*, two mi NE of Concow Reservoir and 16 mi E of Chico, 2004, 2849 ft, *CPD & Toren 1819* (RMA); on rocky soils of road cut along Pulga Rd, five mi SW of Cresta, 2011, 1500 ft, *CPD 2655* (RMA). **Yuba:** on soil in root wad sinkhole, seven mi SSE of community of Woodleaf, 2010, 2600 ft, *Toren s.n. 11 May 2010* (RMA).

Fissidens ventricosus Lesquereux

Common; on rocks either submerged in creeks or in the splash zone of small waterfalls and cascades. Sporophytes uncommon.

Butte: on rock in cascade of tributary stream to Ponderosa Reservoir, 1.5 mi NW of Forbestown, 2003, 2800 ft, *CPD 930* (RMA); on rock in Martin Creek, 1 mi SW of Brush Creek, 2002, 2700 ft, *CPD 844* (CAS). **Plumas:** on rock in splash zone of 1-foot-tall waterfall, four mi WSW of Portola. **Sierra:** on submerged rock in Morris Ravine, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2318* (RMA). **Yuba:** on shallowly submerged rock in tributary to Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1194* (UC).

Fontinalis antipyretica Hedwig

Uncommon, submerged aquatic, underneath moderate to dense canopy. No collections with sporophytes.

Plumas: attached to wood in intermittent stream, four mi N of Antelope Lake, 2002, 1820 m, *CPD 669* (UC).

Sierra: submerged in rapidly flowing little Rock Creek underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1886* (RMA). **Yuba:** submerged in tributary to Diamond Ravine, three mi E of Strawberry Valley, 2005, 3729 ft, *CPD 1929* (RMA).

Fontinalis howellii Renaud & Cardot

Rare, submerged aquatic. No collections with sporophytes.

Plumas: on edge of Fowler Lake, three mi N of Little Grass Valley Reservoir, 2001, 5480 ft, *CPD, Hanson & Norris 410* (RMA).

Note: Determined in 2001 by Norris and verified in 2009 by Toren and Dillingham.

Fontinalis mollis Müller Hal.

Uncommon, submerged aquatic, underneath moderate to dense canopy. Neither collection with sporophytes.

Sierra: submerged on rock in center of stream, three mi NW of Calpine, 2002, 1614 m, *CPD 632* (Harpel personal herbarium, RMA); in dried out stream bed, about 1/4 mi downstream from *CPD 632* collection locality, 2002, 1604 m, *CPD 634* (UC).

Fontinalis neomexicana Sullivant & Lesquereux

Common, submerged aquatic, often attached to rock. No collections with sporophytes.

Butte: submerged in tributary to Fall River, 20 mi NE of Oroville, 2002, 4034 ft, *CPD 924* (UC); attached to rocks, submerged in Lockerman Creek, two mi NW of Cresta, 2004, 3140 ft, *CPD & Toren 1772* (RMA).

Plumas: submerged in remnant pool of ephemeral stream, two mi W of Little Grass Valley Reservoir, 2002, 5380 ft, *CPD & Gross 920* (UC); submerged in Pierce Creek, five mi W of Thompson Peak, 2002, 1943 m, *CPD 1087* (UC). **Yuba:** submerged in tributary to Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1198* (RMA); submerged in tributary to Gold Run Creek, five mi SW of LaPorte, 2005, 4360 ft, *CPD 1976* (RMA).

Frisvollia varia (Mitten) Sawicki, Szczecińska, Bednarek-Ochyra & Ochyra

[*Racomitrium varium* (Mitten) A. Jaeger; *Codriophorus varius* (Mitten) Bednarek-Ochyra & Ochyra]

Uncommon; usually on dry rock underneath sparse to dense forest canopy. Sporophytes uncommon.

Butte: on dry rock in riparian zone, two mi NW of Forbestown, 2003, 2320 ft, *CPD 933* (CAS, Harpel personal herbarium); on granite outcrop near town of Brush Creek, 2002, 2903 ft, *CPD 524* (UC); on base of large granitic outcrop, 2004, 3036 ft, *CPD & Toren 1742* (CAS, KRAM). **Plumas:** on dry rock outcrop four mi NE of Quincy, 2004, 4121 ft, *CPD 1301* (CAS, KRAM, determined by Bednarek-Ochyra).

Note: I have followed Sawicki et al. (2015) and recognize the new genus *Frisvollia* Sawicki, Szczecińska, Bednarek-Ochyra & Ochyra to accommodate *F. varia* (Mitt.), a species that has recently been placed in *Codriophorus* as *C. varius* (Mitt.) Bednarek-Ochyra & Ochyra.

Funaria hygrometrica Hedwig

Common; on disturbed moist soil, especially in areas with charcoal. Sporophytes almost always present.

Plumas: on small log in fen-like wetland at Little Summit Lake, 17 mi E of Quincy, 2005, 5813 ft, *CPD 2112* (RMA); on charcoal soils adjacent to Denten Creek, 1 mi E of Graeagle, 2004, 4700 ft, *CPD & Miller 1363*

(RMA). **Sierra:** on bare soils with charcoal adjacent to Rock Creek underneath moderate forest canopy. **Yuba:** on charcoal soils, five mi SE of Challenge, 2003 2240 ft, *CPD 968* (UC).

Gemmabryum badium (Bridel) J.R. Spence

Rare; on thin soil in exposed site. Single collection without sporophytes.

Plumas: on thin crust of dry soil on an exposed rock outcrop in a coniferous forest, eight mi W of Quincy, 2003, 4240 ft, *CPD 926* (Spence personal herbarium, UC).

Gemmabryum barnesii (J.B. Wood ex Schimper) J.R. Spence

Rare; on thin soil over rock. Sporophytes on single collection.

Plumas: on thin decomposed granitic soil over rock, W of Tobin Bridges over Hwy 70, six mi SW of Belden, 2011, 1988 ft, *CPD 2670* (RMA, determined by Spence, Slack and Toren).

Gemmabryum brassicoides J.R. Spence & Kellman

Rare; on rock in full sunlight. No collections with sporophytes.

Plumas: on exposed rock outcrop in Stag Creek drainage, four mi NW of Little Grass Valley Reservoir, 2002, 1715 m, *CPD & Gross 916* (Spence personal herbarium); on rocky stream bank under open forest canopy adjacent to tributary to Middle Fork Feather River, 1.5 mi E of Graeagle, 2004, 4603 ft, *CPD & Toren 1724* (RMA, Spence personal herbarium).

Note: This is a recently described species (Spence and Kellman 2015). J. Spence verified these two specimens. The species is characterized by having concave and ovate leaves with a short excurrent costa, and gemmiform stems.

Gemmabryum caespitium (Hedwig) J.R. Spence

Rare; on thin soil in rock crevices. Sporophytes on both collections.

Plumas: on thin soil over rock, near Pilot Peak, 1 mi W of Onion Valley, 2009, 6000 ft, *Toren s.n. 23 June 2009* (RMA, determined by Toren and Harpel); on disturbed moist soil in middle of 100-acre Walker Mine copper mine tailings, 15 mi E of Quincy, 2005, 5760 ft, *CPD, Toren & Friend 2063* (RMA, Spence personal herbarium).

Note: This species is difficult for me to identify and I generally have undercollected this group. Therefore it may be more common than collections currently suggest. Spence has suggested it to be a common species (personal communication 2014).

Gemmabryum dichotomum (Hedwig) J.R. Spence & H.P. Ramsay

Rare; on rock. No sporophytes on single collection.

Plumas: on rock in seep in roadside opening in forest near headwaters of Dolly Creek, 16 mi E of Quincy, 2005, 6272 ft, *CPD, Toren & Friend 2044* (Spence personal herbarium).

Note: includes *Bryum bicolor* Dickson.

Gemmabryum vinosum J.R. Spence & Kellman

Rare; on rock or soil over rock in full sun. No sporophytes on collection.

Plumas: on dry rock out crop with sparse canopy cover, adjacent to tributary to Greenhorn Creek, seven mi E of Quincy, 2004, 4040 ft, *CPD 1394* (UC, Spence).

Note: The recent description of this species (Spence and Kellman 2015) includes *CPD 1394* as a paratype specimen. It is characterized by forming dense tufts of strongly reddish leaves, with short, ovate leaves and a short excurrent costa that is often hyaline.

Gemmabryum violaceum (Crundwell & Nyholm) J.R. Spence

Rare; on rock. Single collection without sporophytes.

Plumas: on dry rock outcrop of conglomerate volcanic tuff underneath open *Abies magnifica* canopy in the headwaters of Cascade Creek, 13 mi E of Quincy, 2005, 6669 ft, *CPD 2076* (Spence personal herbarium).

Grimmia alpestris (F. Weber & D. Mohr) Schleicher

Common, on exposed rock. Sporophytes common.

Plumas: on rock near Silver Lake, Bucks Lake Wilderness, 2001, 5900 ft, *CPD 436* (RMA); on large dry rock, in Stag Creek drainage, four mi NE of Little Grass Valley Reservoir, 2002, 5640 ft, *CPD & Gross 908* (UC); on rock six mi WNW of LaPorte, 2002, 5240 ft, *CPD 1062* (RMA); in crevices of shaded serpentine rock near Pilot Peak, 2007, 6300 ft, *Toren 9599* (CAS, determined by Hastings).

Grimmia anomala Hampe ex Schimper

Common on dry rock underneath moderate to dense forest canopy; generally above 5000 ft elevation. No collections with sporophytes; apical leaf gemmae common.

Plumas: on shaded granite rock outcrop near outlet to Gold Lake, Bucks Lake Wilderness, 11 mi W of Quincy, 2001, 5852 ft, *CPD, Hanson & Norris 1190* (UC); at Onion Valley, 10 mi NE of LaPorte, 2001, 6220 ft, *Norris 83187* (UC); on shaded rock in Grizzly Creek riparian zone, two mi SW of Bucks Lake, 2004, 5090 ft, *CPD, Toren & Friend 1562* (RMA); on rock outcrop underneath dense forest canopy, 1/4 mi W of LaPorte, 2005, 5275 ft, *CPD & Toren 2026* (RMA). **Sierra:** on boulder near Gibson Creek underneath dense forest canopy, 5.5 mi NE of LaPorte, 2005, 5608 ft, *CPD & Toren 2255* (RMA).

Grimmia brevirostris R.S. Williams

Rare; on exposed rock outcrops. Sporophytes common.

Plumas: "Buck's Ranch" (lectotype), 1900, 6500 ft, *Leiberg 5445*, (NY); on dry granite boulders in Granite Basin, three mi N of Bucks Lake, 2013, 5600 ft, *CPD 2742* (CAS, this specimen lacks peristome teeth).

Note: This species was known only from the type specimen and early workers in *Grimmia* assumed that it was the same as *Grimmia hamulosa* Lesquereux, which is the earlier published name. It continued to be included in *G. hamulosa* through the Flora of North America project (Hastings and Greven 2007). However, recent fieldwork by Hastings, Toren, Shevock and Dillingham in Plumas County revealed that both taxa are in fact distinct although they can occur together and occupy the same type of habitat, they are separated by several gametophytic and sporophytic characters. The type specimen of *G. brevirostris* (NY) was also examined by Hastings and the Granite Basin plants match the type specimen. This species is different from typical *Grimmia hamulosa* in the following ways: the outer peristome teeth have longitudinal striations, the costa is more narrow, it has a more narrow leaf apex with shoulders on the leaves and has awns rather than mucous leaves and

straight rather than falcate leaves (R. Hastings personal communication 2013).

Grimmia hamulosa Lesquereux

Uncommon; on exposed rock outcrops, generally above 5000 ft elevation. Sporophytes common.

Plumas: on granite rock outcrop near Gold Lake in Bucks Lake Wilderness, 11 mi W of Quincy, 2001, 5819 ft, *CPD*, *Hanson & Norris 417* (RMA); on large exposed rock, in Stag Creek drainage, four mi NE of Little Grass Valley Reservoir, 2002, 1740 m (5640 ft), *CPD & Gross 915* (UC); on large and dry rock outcrop, 11 mi E of Quincy, 2005, 6914 ft, *CPD 2117* (RMA).

Grimmia laevigata (Bridel) Bridel

Uncommon; on dry, exposed rock outcrops. No collections with sporophytes.

Butte: on large granitic rock outcrop, 1.5 mi W of Cresta, 2004, 3036 ft, *CPD & Toren 1739* (CAS); on dry, upland serpentinite rock underneath sparse forest canopy, two mi E of Concow Reservoir, 2004, 3010 ft, *CPD & Toren 1803* (CAS); on dry serpentinite rock, 12 mi E of Chico, 2004, 3054 ft, *CPD & Toren 1826* (CAS); on volcanic rocks, North Table Mountain, *Ahart 10033* (CAS). **Plumas:** on dry, 40-foot-tall rock outcrop in manzanita shrub field, four mi NE of Quincy, 2004, 4363 ft, *CPD 1307* (CAS); on volcanics, E side of Sierra Valley, *Laeger 1076* (CAS).

Note: Fernandez et al. (2006) found molecular differences forming two clades within this species in California. *CPD 1307*, *CPD & Toren 1739*, *1803 & 1826* were within Clade two while *Laeger 1076* and *Ahart 10033* were within Clade 1. Whether or not these two clades form cryptic species within the taxon currently known as *G. laevigata* requires worldwide sampling and further study.

Grimmia leibergii Paris

Rare; on rock. Neither collection with sporophytes.

Plumas: along Berry Creek drainage, three mi NE of Quincy, 2004, 3500 ft, *Clifton B274* (RMA); on metamorphic rocks in a *Quercus chrysolepis* woodland under partial shade, along North Fork Feather River Trail off of Caribou Rd, eight mi above Hwy 70, 2006, 3025 ft, *Shevock 28926* (CAS). **Yuba:** on rock outcrop underneath moderate forest canopy, two mi E of Strawberry Valley, 2005, 2680 ft, *CPD 1848* (RMA).

Grimmia lisae De Notaris

Rare; on ephemeral wet rocks. No sporophytes on single collection examined.

Butte: in ephemeral drainage area leading to Rattlesnake Creek underneath sparse forest canopy, 12 mi E of Chico, 2004, 3098 ft, *CPD & Toren 1823* (RMA). **Plumas:** on sunny exposed granite boulder at high water mark of river, Feather River Canyon below Historic Storrie Bridge, 2006, 1775 ft, *Shevock 28920* (CAS).

Grimmia montana Bruch & Schimper

Common; on dry rock. Sporophytes common.

Butte: on granitic rock outcrop, 1.5 mi W of Cresta, 2004, 3036 ft, *CPD & Toren 1738* (RMA). **Plumas:** on dry volcanic conglomerate rock outcrop, 13 mi E of Quincy, 2005, 6452 ft, *CPD 2103* (RMA). **Sierra:** on rock adjacent to Rock Creek underneath sparse forest canopy, five mi S of LaPorte, 2005, 4042 ft, *CPD 1937* (RMA).

Grimmia ovalis (Hedwig) Lindberg

Rare; on rock with seeps.

Butte: on massive granitic rock slabs and rock walls with seeping water along Hwy 70 just E of Arch Rock in open *Quercus chrysolepis* woodland, 1 mi E of Cresta, 2006, 1575 ft, *Shevock 28912* (CAS).

Grimmia pulvinata (Hedwig) Smith

Common; on rock or concrete, associated with calcium. Sporophytes common.

Plumas: on rock in disturbed opening, six mi E of Quincy, 2004, 3810 ft, *CPD 1245* (RMA); on rock outcrop in riparian zone underneath moderate forest canopy, 1.5 mi E of Graeagle, 2004, 4750 ft, *CPD & Toren 1717* (UC); on cement at upstream end of Caribou Powerhouse along East Branch of North Fork Feather River, 15 mi NW of Quincy, 2006, 3000 ft, *CPD*, *Kellman & Shevock 2355* (RMA); on rock in *Purshia tridentata* opening in pine forest, 1.5 mi NW of Cromberg, 2007, 4680 ft, *CPD & Toren 2385* (RMA). **Yuba:** on concrete bridge abutment, five mi SE of Challenge, 2010, 2000 ft, *Toren 9739* (RMA).

Grimmia ramondii (Lamarck & de Candolle) Margadant
Common; on wet or dry rock, generally underneath dense forest canopy. Sporophytes uncommon.

Plumas: on granite rock outcrop adjacent to Gold Lake, 11 mi W of Quincy, 2001, 5819 ft, *CPD*, *Hanson & Norris 415* (RMA); on rock underneath dense forest canopy on Rock Island Ridge, 13 mi W of Quincy, 2004, 5052 ft, *CPD 1600* (RMA); on rock adjacent to Poplar Creek, four mi SW of Cromberg, 2007, 4880 ft, *CPD & Toren 2372* (RMA). **Sierra:** on saturated rock in headwater tributary to Gold Run Creek, five mi SW of LaPorte, 2005, 4570 ft, *CPD & Toren 1997* (RMA); on dry boulder underneath dense forest canopy, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2247* (RMA).

Grimmia serrana J. Muñoz, Shevock & D.R. Toren

Rare; on rock. Sporophytes common.

Butte: on large granitic rock outcrop at Big Bald Rock, three mi SE of Brush Creek community, 2004, 3270 ft, *Toren s.n.* (CAS). **Plumas:** on large granitic rock outcrop, 18 mi E of Chico, 2004, 3036 ft, *CPD & Toren 1741* (UC).

Grimmia torquata Drummond

Uncommon; on rock, often growing on shaded cliffs or under moderate to dense forest canopy. No collections with sporophytes.

Plumas: on vertical rock cliff in narrow ravine in spray zone of waterfall along Clark's Ravine, 29 mi E of Oroville, 2005, 4050 ft, *CPD 2037* (UC); on dry rock underneath partial forest canopy in narrow canyon of East Branch North Fork Feather River, 15 mi NW of Quincy, 2006, 3000 ft, *CPD*, *Kellman & Shevock 2356* (RMA). **Sierra:** on shaded 30-foot-tall slate rock cliff under moderate forest canopy, five mi NE of LaPorte, 2005, 4950 ft, *CPD 2266* (UC); on rock underneath dense forest canopy adjacent to tributary to Cedar Grove Ravine, 3.5 mi E of LaPorte, 2005, 4912 ft, *CPD & Toren 2280* (RMA).

Grimmia trichophylla Greville

Common; the most common *Grimmia* in the study area. On dry rocks in a variety of habitats. Sporophytes common.

Butte: on decomposed granite outcrop, 1 mi NE of Brush Creek community, 2002, 2908 ft, *CPD 531* (UC); on dry rock in riparian zone along tributary to Lake Oroville, two mi WNW of Forbestown, 2003,

2320 ft, *CPD* 937 (RMA); on dry, upland serpentinite rock outcrop, 16 mi E of Chico, 2004, 3010 ft, *CPD & Toren 1804* (RMA – note that David Toren lost a bet for a bottle of Arrogant Bastard Ale on his *G. lisae* field determination on this collection). **Plumas:** on granite rock near Silver Lake, 11 mi W of Quincy, 2001, 5900 ft, *CPD, Hanson & Norris 433* (RMA); on dry rock outcrop adjacent to Denten Creek, 1 mi E of Graeagle, 2004, 4700 ft, *CPD & Miller 1355* (RMA). **Sierra:** on rock outcrop underneath dense forest canopy, six mi S of LaPorte, 2005, 3800 ft, *CPD 1899* (RMA). **Yuba:** on rock outcrop underneath dense old-growth forest canopy, five mi SW of LaPorte, 2005, 4060 ft, *CPD & Toren 1985* (RMA).

Hedwigia detonsa (M. Howe) W.R. Buck & D.H. Norris
Uncommon; on dry rock. Collections without sporophytes.

Butte: on dry, ultramafic-derived rock underneath sparse forest canopy 12 mi E of Chico, 2004, 3143 ft, *CPD & Toren 1827* (UC); on massive granitic rock in Feather River Canyon immediately E of Arch Rock, 2006, 1575 ft, *Shevock 28913* (CAS). **Plumas:** on rock on margin of road before Caribou Powerhouse, 15 mi NW of Quincy, 2006, 3000 ft, *CPD, Kellman & Shevock 2362* (RMA).

Hedwigia stellata Hedenäs

Rare on dry rock. Single collection with sporophytes.

Butte: on granitic rock outcrop on road cut at milepost 46.0 on Hwy 70, 0.4 mi W of Bear Creek and 10 mi NE of Paradise, 2009, 1500 ft, *CPD 2556* (CAS).

Homalothecium aeneum (Mitten) E. Lawton

Common; on dry, or sometimes wet, rock. Sporophytes uncommon.

Plumas: on rock in splash zone of tributary to Greenhorn Creek, six mi E of Quincy, 2004, 3750 ft, *CPD 1272* (RMA). **Sierra:** on rock outcrop at Little Rock Creek and Rock Creek confluence, six mi S of LaPorte, 2005, 3800 ft, *CPD 1901* (RMA).

Homalothecium aureum (Spruce) H. Robinson

Uncommon; on soil or rocks. Sporophytes present on single collection examined.

Butte: no collection data, 1934, *Koch 1203* (MO); 14 mi E of Chico, 1933, *Ikenberry 1552* (MO). **Plumas:** near edge of Berry Creek, three mi NE of Quincy, 2004, 3500 ft, *Clifton B280* (RMA); on metamorphic rock near Butterfly Valley, six mi NW of Quincy, 1997, 1000 m, *Shevock, Ertter & Morosco 15738* (CAS).

Note: all of these collections were determined as *H. pinnatifidum* (Sullivant) E. Lawton, but I am including them as *H. aureum* to follow Ignatov (2014).

Homalothecium californicum Hedenäs, Huttunen, Shevock & D.H. Norris

Common; on rock in mesic habitats. No collections with sporophytes.

Butte: on north-facing moist granitic rock along Hwy 70 at milepost 46.0, 10 mi NE of Paradise, 2009, 1500 ft, *CPD 2554* (CAS). **Plumas:** on rock outcrop in mesic riparian zone, four mi E of East Quincy, 2004, 3750 ft, *CPD 1276* (RMA); along E branch North Fork Feather River near Caribou, 15 mi NW of Quincy, 2006, 3000 ft, *Kellman, Shevock and Dillingham 5133* (CAS). **Sierra:** on exposed rock cliff above Potosi Creek, six mi E of LaPorte, 2005, 5438 ft, *CPD 2251* (RMA); on slate bedrock adjacent to Cedar Grove

Ravine Creek, three mi E of LaPorte, 2005, 4745 ft, *CPD 2284* (RMA).

Note: The *Kellman, Shevock and Dillingham 5133* collection was included as an additional specimen examined in the description of this species (Hedenäs et al. 2012).

* *Homalothecium megaptilum* (Sullivant) H. Robinson
Rare; thus far found only on dry forest duff over soil. Sporophytes unknown from study area.

Plumas: on dry forest duff over soil in Meadow Valley, four mi NW of Quincy, 2003, 4350 ft, *CPD 925* (CAS, UC). Specimen was verified by Schofield, Toren and Shevock. **Yuba:** on shaded conifer duff, 1/2 mi S of community of Woodleaf, 2010, 3120 ft, *Toren & Simenc 9766* (RMA); on shady mesic soil, 3.2 km S of Woodleaf, 2012, 783 m, *Janeway & Williams 10795* (CAS).

Note: This was cited in Norris and Shevock (2004a) as *Trachybryum megaptilum* (Sullivant) W.B. Schofield but is now placed in *Homalothecium* (Ignatov 2014).

Homalothecium nevadense (Lesquereux) Renauld & Cardot

Common; on rock or sometimes on wood and bases of trees. Sporophytes common.

Plumas: on granite boulder under dense forest canopy, two mi W of Antelope Lake, 2002, 1720 m, *CPD 695* (UC); on ephemerally submerged roots of *Alnus rhombifolia* along tributary to Greenhorn Creek, five mi SE of Quincy, 2004, 3770 ft, *CPD 1269* (UC); on dry rock outcrop, two mi SW of Bucks Lake, 2003, 5220 ft, *CPD, Toren & Heep 1155* (RMA); on dry rock outcrop, 12 mi E of Quincy, 2005, 6042 ft, *CPD 2070* (RMA).

Homalothecium nuttallii (Wilson) A. Jaeger

Common; on base of hardwoods and *Taxus brevifolia*, sometimes on rock or cement. Sporophytes uncommon.

Butte: on base of *Alnus rhombifolia*, underneath dense forest canopy, 1/2 mi NW of Brush Creek community, 2002, 3057 ft, *CPD 518* (UC, Harpel). **Plumas:** on concrete culvert face above stream channel of Denten Creek, 1 mi NE of Graeagle, 2004, 4720 ft, *CPD & Miller 1365* (RMA). **Sierra:** on *Taxus brevifolia* underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1881* (RMA). **Yuba:** on base of *Arbutus menziesii* underneath moderate forest canopy, five mi SE of Challenge, 2003, 2240 ft, *CPD 971* (UC).

Hygroamblystegium varium (Hedwig) Mönkemeyer var. *varium*

Rare; on rock and old mortar. One collection with sporophytes.

Plumas: on exposed canyon walls with seeping water, Feather River Canyon 1 mi W of Belden, 1997, 800 m, *Shevock, Ertter & Morosco 15743* (CAS); on rocks in cascading streamlet, Feather River Canyon near Rock Creek, 2006, 1735 ft, *Shevock 28919* (CAS); Feather River Canyon on 1930's era rock and mortar constructed spring along Hwy 70, eight mi NW of Quincy, 2011, 2900 ft, *CPD 2658* (RMA).

Note: all of these collections were determined as *H. tenax* (Hedwig) Jennings, but I am including them as *H. varium* var. *varium* to follow Vanderpoorten (2014).

Hygrohypnum bestii (Renauld & Bryhn) Holzinger

Uncommon; on submerged rocks in perennial streams. No collections with sporophytes.

Plumas: on rock in stream, eight mi NW of Quincy, 2002, 4400 ft, *CPD 890* (UC); on wet rock in Stag Creek, five mi NW of Little Grass Valley Reservoir, 2002, 1707 m, *CPD & Gross 677* (Harpel personal herbarium); on rock under running water from spring fed tributary to Long Valley Creek, 19 mi E of Quincy, 2005, 6196 ft, *CPD 2163* (RMA); on rock in cascading streamlet in Feather River Canyon near Rock Creek, 2006, 1735 ft, *Shevock 28917* (CAS).

Hygrohypnum luridum (Hedwig) Jennings

Uncommon; on submerged rocks in perennial streams. No collections with sporophytes.

Plumas: on rock submerged in stream, 1 mi S of Bucks Lake, 2004, 5398 ft, *CPD & Toren 1585* (RMA); attached to rock, submerged in Letterbox Creek, three mi W of Bucks Lake, 2003, 4611 ft, *CPD 1226* (UC); on saturated rock at edge of South Fork Long Valley Creek, four mi E of Cromberg, 2004, 6037 ft, *CPD 1578* (RMA, Janssens personal herbarium); attached to submerged rocks in Jackson Creek, 4.5 mi N of Blairsden, 2004, 5927 ft, *CPD & Toren 1616* (RMA).

Hygrohypnum molle (Hedwig) Loeske

Uncommon; on rocks, submerged in streams or in springs. No collections with sporophytes.

Plumas: stream near Johnsville, *Ikenberry 371* (MO – determined by Koch); attached to rock in spring underneath dense forest canopy, 16 mi E of Quincy, 2005, 6069 ft, *CPD 2141* (RMA). **Sierra:** on rock in splash zone of Gibson Creek underneath dense forest canopy, five mi NE of LaPorte, 2005, 5608 ft, *CPD & Toren 2252* (RMA).

Hygrohypnum ochraceum (Turner ex Wilson) Loeske

Uncommon; on wet rocks and wood. No collections with sporophytes.

Plumas: in ephemeral drainage across granitic soils, near Gold Lake in Bucks Lake Wilderness, 11 mi W of Quincy, 2001, 6010 ft, *CPD, Hanson & Norris 437* (RMA, Harpel personal herbarium); on saturated rotten wood in headwaters of Tollgate Creek underneath moderate forest canopy, nine mi NE of Quincy, 2004, 5935 ft, *CPD 1427* (RMA); on wet rock in splash zone of Long Valley Creek, 20 mi E of Quincy, 2005, 6567 ft, *CPD & Toren 2334* (RMA). **Sierra:** on rock under 5-ft-tall dripping waterfall in tributary to Rock Creek, 30 mi E of Oroville, 2005, 4240 ft, *CPD 1923* (RMA); on rock at stream margin in Sears Ravine, three mi NE of LaPorte, 2005, 4860 ft, *CPD 2268* (UC).

Hygrohypnum smithii (Swartz) Brotherus

Plumas: stream near Quincy, *Ikenberry 1322* (MO).

Note: specimen found during on line herbarium search but not examined by this author. This record is considered unconfirmed.

Hymenostylium recurvirostrum (Hedwig) Dixon

Rare, on rock. No sporophytes on either collection by author, Showers collection not examined.

Plumas: on rock with seeping water and calcium deposits underneath moderate forest canopy along East Branch North Fork Feather River, 15 mi NW of Quincy, 2006, 3000 ft, *CPD & Miller 2341* (CAS, MO, determined by Zander); on granitic rock outcrop along road cut, 0.5 mi E of the Butte County line on Hwy 70, 24 mi W of Quincy, 2009, 1700 ft, *CPD 2559* (RMA); on wet soil over calcareous rock, North Fork Feather River

Canyon at Caribou, 1976, 3000 ft, *Showers 3339*, (MO, determined by Zander).

**Hypnum circinale* Hooker

Uncommon; on downed logs and base of conifers. Sporophytes unrecorded.

Butte: on rotten Douglas-fir log over tributary to Peavine Creek, two mi NE of Brush Creek, 2003, 3000 ft, *CPD 856* (UC); on cedar bark and base of Douglas-fir along tributary to Flea Creek, two mi NE of Concow Reservoir and 16 mi E of Chico, 2004, 2919 ft *CPD & Toren 1816* (UC). **Plumas:** on base of old-growth Douglas-fir in American House Ravine, 29 mi E of Oroville, 2005, 4175 ft, *CPD & Toren 2015* (RMA); on base of Douglas-fir along French Creek mesic riparian zone, eight mi SW of LaPorte, 2009, 3980 ft, *CPD & Toren 2593* (CAS); on base of old-growth Douglas-fir in Clark's Ravine, 29 mi E of Oroville, 2005, 4100 ft, *CPD & Toren 2038* (UC).

Hypnum subimponens Lesquereux

Common; on wood, rock and soil underneath moderate to dense forest canopy. Sporophytes common.

Butte: on soil underneath dense forest canopy, five mi E of Brush Creek community, 2002, 2769 ft, *CPD 538* (UC); on dry rock in riparian zone underneath dense forest canopy, two mi WNW of Forbestown, 2003, 2320 ft, *CPD 931* (CAS). **Plumas:** on rock underneath dense forest canopy, two mi W of Little Grass Valley Reservoir, 2002, 5380 ft, *CPD & Gross 919* (RMA, Harpel personal herbarium); on moist vertical rock wall adjacent to cascading stream, seven mi E of Quincy, 2004, 3794 ft, *CPD 1293* (RMA). **Sierra:** on conifer log suspended over Little Rock Creek underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1870* (RMA). **Yuba:** on base of *Pseudotsuga menziesii*, five mi SW of LaPorte, 2005, 4060 ft, *CPD & Toren 1980* (RMA).

Imbriobryum alpinum (Hudson ex Withering) N. Pedersen
Uncommon, on soil and rock in wet meadows and stream margins. Sporophytes present on one collection (*Ahart and Dittes 12435*).

Plumas: in unnamed meadow 1 mi E of Little Grass Valley Reservoir, 2002, 1704 m, *CPD & Gross 679* (RMA, determined by Toren and Spence 2014); on wet soil in serpentine seep in full sun, two mi S of Bucks Lake, 2009, 5500 ft, *Toren s.n.* (CAS 1168987); on rocks along dry stream about 0.5 mi NE of Eisenhower Peak, 2005, 6698 ft, *Ahart and Dittes 12435* (CAS, CHSC); on wet soil in a small meadow about 1.5 mi NW of Little Grass Valley Reservoir, 2002, 5417 ft, *Ahart and Dittes 9724* (CAS, CHSC).

Note: D. Toren determined each of these four collections in 2014.

Imbriobryum miniatum (Lesquereux) J.R. Spence

Common; on seasonally wet rock and less commonly on soil. Sporophytes uncommon.

Butte: on massive granitic rock in Feather River Canyon immediately E of Arch Rock, 2006, 1575 ft, *Shevock 28915* (CAS). **Plumas:** on seeping bedrock along ephemeral tributary to Greenhorn Creek, seven mi E of Quincy, 2004, 4040 ft, *CPD 1390* (Spence); on rocky flat at edge of pool of water in tributary to Middle Fork Feather River, two mi SW of Portola, 2002, 1540 m, *CPD & Gross 599* (Harpel); on dry log two feet from live spring under dense forest canopy on

Hartman Bar Ridge, 31 mi NE of Oroville, 2002, 5440 ft, *CPD & Gross 918* (Spence personal herbarium, UC). **Sierra:** on slate bedrock in narrow stream gorge in Cedar Grove Ravine, three mi E of LaPorte, 2005, 4745 ft, *CPD & Toren 2289* (RMA).

Imbricbryum muehlenbeckii (Bruch & Schimper) N. Pedersen

Common; on ephemerally moist soil and rock under open to moderate forest canopy. Sporophytes uncommon.

Plumas: on sandy soil in ephemeral riparian zone under sparse forest canopy, two mi E of Portola, 2002, 1496 m, *CPD & Gross 571* (Spence personal herbarium, UC); on moist soil in meadow opening near South Branch of Ward Creek, 16 mi E of Quincy, 2005, 6671 ft, *CPD, Toren & Friend 2060* (RMA, Spence personal herbarium); on vertical, seeping rock face under sparse forest canopy in unnamed tributary to Willow Creek, three mi NE of Graeagle, 2004, 5851 ft, *CPD 1512* (RMA); on soil in spring in forest opening adjacent to tributary to Rabbit Creek, 1/4 mi W of LaPorte, 2005, 4978 ft, *CPD & Toren 2028* (RMA).

Imbricbryum torenii J.R. Spence & Shevock

Uncommon; on soil and rock in full sunlight. No collections with sporophytes.

Plumas: on edge of ephemeral stream, three mi SE of Portola, 2002, 5200 ft, *CPD & Gross 586* (Spence personal herbarium, UC); above small pool of water in full sun, two mi SW of Portola, 2002, 1540 m, *CPD & Gross 606* (Spence personal herbarium, UC); on rock in meadow in full sun, 1 mi E of Little Grass Valley Reservoir, 2002, *CPD & Gross 679* (Harpel per. herb., Spence personal herbarium, UC); Highway 70 near Belden Norris 69975 (UC).

Note: This recently described species (Spence and Shevock, 2015) is characterized by having shiny-metallic red or green leaves but is distinguished from *I. muehlenbeckii* and *I. alpinum* in having broadly ovate leaves with short distal laminal cells and a short excurrent costa and a cylindric capsule with large spores.

Isopterygiopsis pulchella (Hedwig) Z. Iwatsuki

Uncommon; on moist rock. Sporophytes common.

Plumas: on wet rock 1/2 mi W of Little Grass Valley Reservoir, 2009, 5200 ft, *CPD & Toren 2564* (CAS). **Sierra:** on deeply shaded, moist vertical rock face and in small cave/adit entrance of "Wink Eye Mine" with dripping water, along Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2225* (RMA).

Isothecium cardotii Kindberg

Common on W side of study area; on tree boles and on rock and wood on forest floor. Sporophytes common.

Butte: on vertical rock wall in roadside opening, two mi NW of Forbestown, 2003, 1588 ft, *CPD 1131* (RMA); on rock ledge of exposed vertical rock wall in riparian zone, two mi NW of Forbestown, 2003, 1588 ft, *CPD 1128* (UC). **Yuba:** on moist rotten wood underneath dense forest canopy, three mi SE of Challenge, 2003, 2350 ft *CPD 987* (RMA).

Note: Although I am unconvinced that there is a reliable break between *I. cardotii* and *I. stoloniferum*, I have determined both species as recognized in Norris & Shevock (2004b) and Schofield (2014).

Isothecium cristatum (Hampe) H. Robinson

Abundant on W side of study area; on rotting wood, bases of trees and over rock. Sporophytes common.

Butte: on stump underneath dense forest canopy, 18 mi E of Chico, 2004, 3206 ft, *CPD & Toren 1762* (RMA). **Plumas:** on base of mature *Pseudotsuga menziesii* underneath dense forest canopy, four mi NE of Strawberry Valley, 2005, 3580 ft, *CPD 2010* (RMA). **Yuba:** on rotting wood on forest floor underneath dense forest canopy, five mi SE of Challenge, 2003, 2220 ft, *CPD 962* (RMA); over rock underneath dense forest canopy, 1/2 mi SE of Forbestown, 2003, 2600 ft, *CPD 1102* (UC).

Isothecium stoloniferum Bridel

Common on W side of study area; on tree boles and on rock and wood on forest floor underneath moderate to dense forest canopy. Sporophytes common.

Butte: on rock boulder underneath dense forest canopy, five mi N of Forbestown, 2003, 2160 ft, *CPD 1031* (UC); on fallen *Taxus brevifolia* underneath dense forest canopy, 18 mi E of Chico, 2004, 3206 ft, *CPD & Toren 1759* (RMA). **Sierra:** on rocks adjacent to Morris Ravine underneath dense forest canopy, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2316* (RMA). **Yuba:** on *Lithocarpus densiflorus* underneath dense forest canopy, 1 mi S of Challenge, 2003, 2520 ft *CPD 1201* (UC).

Note: see comment under *I. cardotii* above.

Kindbergia oregana (Sullivant) Ochyra

Uncommon; on soil, leaf litter and over logs underneath dense forest canopy. No collections with sporophytes.

Butte: on rotted *Pseudotsuga menziesii* log underneath dense forest canopy, 18 mi E of Chico, 2004, 3206 ft, *CPD & Toren 1753* (RMA). **Yuba:** on roadside soils underneath moderate forest canopy, five mi SE of Challenge, 2003, 2220 ft, *CPD 959* (RMA); on forest soil underneath dense forest canopy, two mi E of Strawberry Valley, 2005, 2900 ft, *CPD 1842* (RMA); on forest duff adjacent to perennial tributary to Dry Creek underneath dense forest canopy, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1197* (RMA).

Kindbergia praelonga (Hedwig) Ochyra

Abundant; on soil and rock on margins of seeps, springs and creeks, uncommonly submerged in clear streams. It is also an abundant terrestrial species on W side of study area. The species is present in most moderate and lower elevations riparian zones in the study area. Sporophytes rare.

Butte: on wet soil on vertical dripping seep, two mi NW of Forbestown, 2003, 2070 ft, *CPD 1021* (RMA).

Plumas: on soil at edge of stream, 1 mi S of Bucks Lake, 2004, 5398 ft, *CPD & Toren 1586* (RMA); submerged underneath one-foot-deep stream at Domingo Spring, eight mi NW of Chester, 2003, 1547 m, *CPD 965* (CAS, MO, RMA). **Sierra:** on organic soils at edge of spring-fed tributary to Rock Creek, 30 mi E of Oroville, 2005, 4240 ft, *CPD 1917* (RMA). **Yuba:** submerged in headwaters of Indian Creek, underneath dense forest canopy, 1/2 mi S of Woodleaf, 2003, 3040 ft, *CPD 1220* (RMA).

Leptobryum pyriforme (Hedwig) Wilson

Uncommon; on moist soil or rotting wood. Sporophytes common.

Plumas: on tree stump in moist seeping spring at Blakeless Spring, three mi NW of Lake Davis, 2003, 6370 ft, *CPD 1103* (RMA); on moist soil at margin of Dolly Creek, 14 mi E of Quincy, 2005, 5724 ft, *CPD 2120* (RMA); on calcium encrusted pine stump in fen-like wetland 15 mi E of Quincy, 2005, 6414 ft, *CPD 2151* (RMA); on soil in seep adjacent to Little Long Valley Creek, two mi N of Cromberg, 2007, 4880 ft, *CPD 2405* (RMA).

Leptodictyum riparium (Hedwig) Warnstorf

Rare; found on wood in stream channel. Sporophytes unknown in study area.

Plumas: on log in center of intermittent stream five mi N of Antelope Lake, 2002, 5480 ft, *CPD 670* (RMA, Harpel personal herbarium); on tree root in dry stream channel, 1 mi N of Bagley Pass and 11 mi NNW of Portola, 2007, 5880 ft, *CPD & Toren 2401* (UC).

Leucolepis acanthoneura (Schwägrichen) Lindberg

Uncommon; on moist soil, soil over rock and in organic forest litter, often on the margins of creeks. No collections with sporophytes.

Butte: on moist soil at edge of spring underneath dense forest canopy, 18 mi E of Chico, 2004, 3206 ft, *CPD & Toren 1747* (RMA). **Plumas:** on moist soil in riparian zone, five mi NW of Quincy, 2002, 3640 ft, *CPD 882* (RMA). **Sierra:** on organic soils at margin of creek in Morris Ravine, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2320* (RMA). **Yuba:** on soil over rock in channel of Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1196* (RMA).

Meesia triquetra (Linnaeus ex Jolyclerc) Åongström

Uncommon; found on saturated soils in fens. Sporophytes rare.

Plumas: on soil in fen at Tamarack Flat, seven mi SW of Quincy, 2001, 5400 ft, *CPD 396* (UC); on soil in fen, 11 mi WNW of Quincy, 2002, 1585 m, *CPD 671* (UC, Harpel personal herbarium); on soil in fen at Bucks Summit, 10 mi WSW of Quincy, 2003, 1690 m, *CPD 1122* (MO, UC).

Meesia uliginosa Hedwig

Rare; on saturated wood in fens. Extensive surveys by U.S. Forest Service botanists for this species due to being listed as a Forest Service sensitive species and only two sites found. Sporophytes present on both collections.

Plumas: on rotting stumps in fen near Freeman Creek, eight mi NW of Portola, 2004, 5900 ft, *Toren 9348* (CAS, UC); on old log in stream channel in wet meadow, two mi W of Lake Davis and 9.5 mi NW of Portola, 2007, 5830 ft, *CPD 2364* (UC).

Meiotrichum lyallii (Mitten) G.L. Merrill

Common; on seasonally or perennially moist soil, in full sun or under dense forest canopy. Sporophytes uncommon.

Plumas: on moist soil in meadow opening, 16 mi E of Quincy, 2005, 6671 ft, *CPD, Toren & Friend 2064* (RMA); on ephemerally moist mineral soils on old roadbed, 10 mi NE of Greenville, 2005, 5888 ft, *CPD & Toren 2181* (RMA). **Sierra:** on moist soil near Potosi Creek, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2242* (RMA). **Yuba:** on soil adjacent to tributary to Slate Creek, four mi SW of LaPorte, 2005, 4060 ft, *CPD 1972* (RMA).

Mielichhoferia elongata (Hoppe & Hornschuch) Nees & Hornschuch

Rare; on roadside cutbank of mineral rich soils. No sporophytes at known site.

Plumas: on mineral soils in seep on roadside cutbank through phyllite rock type, five mi E of Twain and 1/8 mi north of Paxton in Feather River Canyon, 2009, 2993 ft, *CPD 2561* (DUKE).

Mnium marginatum (Dickson ex Withering) P. Beauvois.

Uncommon; on saturated soil, or less commonly on rock. Sporophytes common.

Plumas: on moist soil on margin of Jackson Creek, five mi N of Blairsden, 2004, 5927 ft, *CPD 1614* (UC); on saturated log in splash zone of Joseph Creek, 12 mi E of Quincy, 2005, 6331 ft, *CPD 2067* (RMA); on saturated soil in seep coming from base of rock cliff, 13 mi E of Quincy, 2005, 6452 ft, *CPD 2100* (RMA).

**Neckera douglasii* Hooker

Rare; found on trees in wet forests on W side of study area. No collections with sporophytes.

Butte: on *Lithocarpus densiflorus* bole underneath dense forest canopy, 1 mi E of Brush Creek community, 2002, 2763 ft, *CPD 508* (UC); on bole of fallen *Lithocarpus densiflorus*, underneath dense forest canopy at Challenge Work Center, 2004, 2900 ft, *Toren 9339* (RMA).

Neckera menziesii Drummond

Uncommon; on rock or hardwoods in shaded conditions. No collections with sporophytes.

Plumas: on base of *Alnus rhombifolia* adjacent to tributary to Greenhorn Creek, seven mi E of Quincy, 2004, 3794 ft, *CPD 1287* (UC); on rock underneath moderate forest canopy near Caribou Powerhouse, 15 mi NW of Quincy, 2006, 3000 ft, *CPD & Miller 2344* (RMA); on moist rock outcrop in Clark's Ravine, 29 mi E of Oroville, 2005, 4420 ft, *CPD 2039* (RMA). **Sierra:** on rock underneath dense forest canopy, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2319* (RMA).

Niphotrichum elongatum (Ehrhart ex Frisvoll) Bednarek-Ochyra & Ochyra

[*Racomitrium elongatum* Ehrhart ex Frisvoll]

Rare, one collection; on sandy soil. Sporophytes unknown.

Plumas: on sandy soil in historical (1850's) mining tailings at "Barnard's Diggings", 28 mi E of Oroville, 2005, 4760 ft, *CPD 2040* (KRAM, UC, determined by Bednarek-Ochyra).

Nogopterium gracile (Hedwig) Crosby & W.R. Buck

Rare; on the bark of hardwood trees or on dry rock. Sporophytes absent on both collections. **Butte:** on *Acer macrophyllum* tree bole, 19 mi E of Chico, 2004, 3140 ft, *CPD & Toren 1786* (RMA). **Yuba:** on rock outcrop, two mi E of Strawberry Valley, 2005, 2680 ft, *CPD 1849* (RMA).

Oncophorus virens (Hedwig) Bridel

Uncommon; on wet wood underneath canopy cover in riparian zones above 5000 ft. Sporophytes common.

Plumas: on wet log along creek, three mi SE of Bucks Lake, 2004, 5500 ft, *Toren s.n.16 June 2004* (RMA); on moist log along seeping headwaters of Miller Creek underneath dense canopy of *Alnus tenuifolia*, six mi WSW of Cromberg, 2007, 6120 ft, *CPD 2388* (RMA); on wet rotted wood along headwaters of Cascade Creek,

13 mi E of Quincy, 2005, 6472 ft, *CPD & Toren 2094* (RMA); on saturated wood in Long Valley Creek, 20 mi E of Quincy, 2005, 6567 ft, *CPD & Toren 2172* (RMA).

Orthodicranum tauricum (Sapjegin) Smirnova

Abundant; on downed logs, stumps and bark of live or dead trees. Sporophytes common.

Butte: on base of *Pseudotsuga menziesii* underneath sparse forest canopy, 18 mi E of Chico, 2005, 3036 ft, *CPD & Toren 1731* (RMA). **Plumas:** on rotting wood adjacent to Denten Creek, 1 mi E of Graeagle, 2004, 4700 ft, *CPD & Miller 1361* (RMA); on *Acer macrophyllum*, 1/4 mi NW of Brush Creek community, 2002, 3057 ft, *CPD 520* (UC). **Sierra:** on stump of *Pseudotsuga menziesii* along Little Rock Creek underneath dense forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1862* (RMA). **Yuba:** on moist rotten log underneath dense forest canopy, three mi SE of Challenge, 2003, 2350 ft, *CPD 984* (RMA).

Orthotrichum affine Schrader ex Bridel

Rare; on tree boles. Sporophytes common.

Plumas: on *Alnus rhombifolia* bole underneath dense forest canopy along Greenhorn Creek, five mi E of Quincy, 2004, *CPD 1648* (RMA); in riparian zone of Sulphur Creek, four mi W of Portola, 2002, 1402 m, *CPD 548* (UC); on *Abies concolor* snag underneath dense forest canopy, four mi W of Thompson Peak, 2002, 2006 m, *CPD 1083* (RMA).

Orthotrichum confusum R. Medina, F. Lara & Garilleti
Uncommon; on tree boles, generally underneath dense forest canopy. Sporophytes common.

Butte: on base of *Taxus brevifolia* adjacent to Lockerman Creek, 19 mi E of Chico, 2004, 3180 ft, *CPD & Toren 1790* (UC, MAUAM); on shaded hardwood branches above small creek along Forest Rd 23N30, three mi E of Cresta, 2009, 4500 ft, *Toren 9721* (CAS, MAUAM). **Plumas:** on bole of *Alnus rhombifolia* in French Creek, eight mi SW of LaPorte, 2009, 3980 ft, *CPD 2596* (MAUAM). **Sierra:** on bark of *Taxus brevifolia* adjacent to Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD & Toren 1884 pro parte* (RMA). **Yuba:** on bole of *Alnus rhombifolia* underneath dense forest canopy along Gold Run Creek, five mi SW of LaPorte, 2005, 4060 ft, *CPD & Toren 1983* (MAUAM, this specimen cited and photos used for species description by Medina et al. 2012).

Note: this species is similar to *O. consimile* Mitten and was described by Medina et al. (2012). Spanish bryologist Francisco Lara determined specimens. This species is different from *O. consimile* in the following ways: filiforme apex of leaves, the leaves slightly flexed and the short cylindrical capsule; there are also differences in peristome ornamentation.

Orthotrichum consimile Mitten

Uncommon; epiphytic under partial shade. Sporophytes common. **Plumas:** on bole of *Alnus rhombifolia* in Feney Ravine, 28 mi E of Oroville, 2005, 3480 ft, *CPD 2006* (MAUAM). **Sierra:** on bole of *Taxus brevifolia* in Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD & Toren 1884* (MAUAM). **Yuba:** on bole of *Acer macrophyllum* in tributary to Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1204* (MAUAM).

Orthotrichum laevigatum J.E. Zetterstedt

Common; on dry or damp rocks in full sun to dense shade; occasionally on wood. Sporophytes common.

Plumas: on dry rock outcrop under dense forest canopy, seven mi SW of Quincy, 2001, 4060 ft, *CPD 395* (UC); on moss-covered base of 50-ft tall monolithic vertical conglomerate volcanic rock with calcium deposits, 13 mi E of Quincy, 2005, 6452 ft, *CPD 2097* (RMA). **Sierra:** on damp rock near Potosi Creek underneath dense forest canopy, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2237* (RMA); on base of tree and exposed roots in steep, narrow stream gorge of Cedar Grove Ravine underneath sparse forest canopy, three mi E of LaPorte, 2005, 4745 ft, *CPD & Toren 2293* (RMA).

Orthotrichum obtusifolium Schrader ex Bridel

Rare, on bark. Sporophytes absent on single collection from study area, but gemmae common.

Plumas: on bark of *Salix* underneath canopy of *Alnus rhombifolia* along Greenhorn Creek, five mi E of Quincy, 2004, 3700 ft, *CPD & Toren 1647* (RMA).

Orthotrichum papillosum Hampe

Abundant on boles and branches of hardwood trees, conifer trees and shrubs underneath moderate to dense forest canopy at low to moderate elevations. Sporophytes common.

Butte: on *Corylus cornuta* stem adjacent to Lockerman Creek, 19 mi E of Chico, 2004, 3180 ft, *CPD & Toren 1784* (RMA). **Plumas:** epiphytic on *Alnus rhombifolia*, eight mi NW of Quincy, 2003, 4400 ft, *CPD & Gross 891* (UC). **Sierra:** on bole of *Pseudotsuga menziesii* in Sackett's Gulch, four mi NE of LaPorte, 2005, 5075 ft, *CPD 2310* (RMA). **Yuba:** epiphytic on *Quercus kelloggii*, six mi SE of Challenge, 2003, 2740 ft, *CPD 945* (RMA, Harpel personal herbarium); epiphytic on *Cornus nuttallii* bole along tributary to Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1205* (UC).

Note: Although *Orthotrichum papillosum* is not commonly recognized by authors outside of California (Vitt 2014), there is good reason to do so. Compared to the interior (European) form of *O. lyellii* Hooker & Taylor, there is a distinct difference in leaf shape, and gemmae are never present (Kellman 2003; Norris and Shevock 2004b). Although some overlapping of range occurs, other authors in California (Kellman 2003; Norris and Shevock 2004b) have noted that *O. papillosum* is much more common in the coastal areas, and *O. lyellii* is more common inland. I have found the reverse: I have never found *O. lyellii sensu stricto* (i.e., no collections with gemmae) in the study area to date.

Orthotrichum pellucidum Lindberg

Rare, on rock. Sporophytes present on single collection. **Butte:** on shaded limestone boulder along Forest Rd 23N30 W of Four Trees, four mi SE of Cresta, 2009, 4500 ft, *Toren 9720* (CAS, determined by F. Lara).

Note: the species may be confused with *O. cupulatum* Hoffman ex Bridel.

Orthotrichum pylaisii Bridel

Rare, on rock. Single collection at NY not reviewed by author.

Plumas: on rock in Graeagle Valley, 1900, 6500 ft, *Leiberg 5469* (NY).

Note: There are several annotation slips on this specimen. The earliest has *O. rhabdophorum* Vent. (determined by Leo Francis Koch Herbarium of the University of Michigan). The second annotation has *O. microblephare* (*O. idahoense*) annotated 1970 by D. H. Vitt (which was

later = *arcticum* written in pencil). Vitt (2014) lists all of these names as synonyms of *Orthotrichum pylaisii*. Vitt is the North American expert on this genus and therefore this determination is trusted.

Orthotrichum rupestre Schleicher ex Schwägrichen
Common; on seasonally submerged or dry rocks, usually underneath forest canopy. Sporophytes common. **Butte**: on dry, upland serpentinite rock underneath sparse forest canopy, 16 mi E of Chico, 2004, 3010 ft, *CPD & Toren 1805* (RMA). **Plumas**: on granite rock in riparian zone, six mi SW from Portola, 2002, 1484 M, *CPD & Gross 564* (UC); on seasonally submerged rock along Yellow Creek, 16 mi NW of Quincy, 2006, 2280 ft, *CPD, B. Shaw, Shevock, Kellman, Vitt & Harpel 2359* (RMA); on volcanic rock outcrop in open *Pinus/Artemisia* community, nine mi NE of Greenville, 2005, 5452 ft, *CPD & Toren 2196* (RMA). **Yuba**: on rock outcrop near tributary to Slate Creek underneath dense forest canopy, two mi E of Strawberry Valley and 30 mi E of Oroville, 2005, 2900 ft, *CPD 1843* (RMA).

Orthotrichum speciosum Nees
Rare; epiphytic under partial shade. Sporophytes present on single collection. **Plumas**: epiphytic on *Cornus* in riparian zone, two mi W from LaPorte in headwaters of Lost Creek, 2009, 5080 ft, *CPD & Toren 2619* (RMA).

Orthotrichum species A
Uncommon; on tree boles, generally underneath dense forest canopy. Sporophytes common.
Butte: on base of *Taxus brevifolia* adjacent to Lockerman Creek, 19 mi E of Chico, 2004, 3180 ft, *CPD & Toren 1790* (UC); on shaded hardwood branches above small creek along Forest Rd 23N30, three mi E of Cresta, 2009, 4500 ft, *Toren 9721* (CAS). **Plumas**: on bole of *Alnus rhombifolia* in Fenev Ravine, 28 mi E of Oroville, 2005, 3480 ft, *CPD 2006* (Madrid University Herbarium).
Note: Dr. Francisco Lara at Madrid University (Universidad Autonoma de Madrid) recognizes this taxon as an undescribed moss related to *O. lyellii*, but with recurved leaf margins and exserted capsules, among other differences; it is widespread along the Sierra Nevada Mountains of California.

Philonotis capillaris Lindberg
Rare; on moist soil. collections without sporophytes.
Butte: on moist soil over rock along old road, 1 mi E of Cresta, 2010, 1560 ft, *Toren 9761* (RMA); on moist sandy soil on road to bear Ranch Creek, opposite Shady Rest Area, S of Arch Rock tunnel, 2011, *Kellman 6120* (CAS) also same locality *CPD 2682* (CAS).

Philonotis fontana (Hedwig) Bridel var. *americana* (Dismier) Flowers ex H.A. Crum
Common; on saturated soils in springs and fens. Sporophytes uncommon. **Plumas**: on saturated soils in spring with *Darlingtonia* in headwaters of Spanish Creek watershed, 10 mi NW of Quincy, 2002, 5200 ft, *CPD & Gross 1138* (FLAS, DUKE); on saturated soils in Buck's Summit Fen, 10 mi W of Quincy, 2005, *CPD 2043* (DUKE); on soil in seep, three mi S of Portola, 2002, *CPD 589* (UC).

Philonotis fontana var. *fontana* (Turner) Bridel
Abundant; on saturated soils in springs and fens. Sporophytes uncommon. **Plumas**: in fen at headwaters of China Gulch Creek, five mi S of Bucks Lake Lodge,

2003, 5410 ft, *CPD 1042* (DUKE); in saturated soil in wet meadow in Pine Creek Valley, nine mi E of Quincy, 2005, 7040 ft, *CPD 2269* (DUKE). **Sierra**: in seep on rock outcrop at mouth of Little Rock Creek, six mi S of LaPorte, 2005, 3800 ft, *CPD 1902* (RMA). **Yuba**: on saturated soil in seep coming into Brushy Creek, 2.5 mi E of Strawberry Valley and 27 mi E of Oroville, 2005, 3501 ft, *CPD 1944* (RMA).

Philonotis fontana (Hedwig) Bridel var. *pumila* (Turner) Bridel
Uncommon; on saturated soils in springs and fens. Sporophytes uncommon. **Plumas**: on rock at edge of seep on Rock Island Ridge, 13 mi W of Quincy, 2004, 5052 ft, *CPD 1602* (RMA); in saturated soil in patch of *Alnus*, three mi W of Bucks Lake, 2003, 5256 ft, *CPD 1047* (DUKE); in saturated soils in fen at headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6907 ft, *CPD & Toren 1667* (RMA).
Note: Two collections from high elevations, *CPD 1035 & CPD 1189* both at DUKE, have much yellower leaves and a different leaf shape than other *P. fontana* collections. They have been reviewed by *Philonotis* expert D. Griffin and he named *CPD 1035* as *Philonotis fontana* variety *pumila* (Turner) Bridel and *CPD 1189* as *Philonotis fontana* (Hedwig) Bridel based on the bicuspid marginal teeth (personal communication). Griffin went further and said that he has found, after reviewing a couple of thousand specimens, which practically every gametophytic character is subject to variation except the bifid teeth. B. Shaw (personal communication 2015) indicated that future studies may reveal novelties with these high elevation samples.

Physcomitrium californicum E. Britton
Uncommon; on moist, often clay soils in forest openings near water. Sporophytes common. **Plumas**: on soil at margin of Little Summit Lake, 17 mi E of Quincy, 2005, 5856 ft, *CPD 2109* (RMA); on eroded moist clay soil on margin of Onion Valley Creek, nine mi NE of LaPorte, 2005, 6221 ft, *CPD & Toren 2264* (RMA).

Plagiomnium cuspidatum (Hedwig) T.J. Koponen
Uncommon; on shaded, wet soil. No collections with sporophytes. **Butte**: on soil at stream margin on Watson Ridge, 21 mi NE of Oroville, 2002, 4034 ft, *CPD 758* (RMA); on seepy rock outcrop underneath dense canopy, two mi NE of town of Brush Creek, 2002, 3080 ft, *CPD & Gross 1166* (RMA). **Plumas**: on saturated soils in spring adjacent to Grizzly Lake, two mi SW of Bucks Lake, 2003, 5150 ft, *CPD 1143* (RMA). **Sierra**: on wet soil in seep in McNair Meadow, nine mi S of Portola, 2002, 1644 m, *CPD 630* (Harpel personal herbarium).

Plagiomnium ellipticum (Bridel) T.J. Koponen
Uncommon; on saturated soils, sometimes in full sun. No collections with sporophytes. **Plumas**: on saturated soils along stream, two mi SE of Portola, 2002, 5640 ft, *CPD & Gross 617* (UC); on saturated soils in headwaters of Boulder Creek, 1.5 mi NW of Thompson Peak, 2002, 1938 m, *CPD & Gross 1071* (UC); on peat soils in full sun of Oldhouse Fen, 10 mi NW of Portola and 1.5 mi W of mouth of Grizzly Creek at Lake Davis, 2007, 5860 ft, *CPD & Toren 2402* (RMA).

Plagiomnium insigne (Mitten) T.J. Koponen
Rare; on wet soil. Neither collection with sporophytes. **Butte**: on soil at stream margin under dense canopy on

Watson Ridge, 21 mi NE of Oroville, 2002, 4034 ft, *CPD & Gross 737* (RMA); on rock dense to stream, 1.5 mi NE of town of Brush Creek, 2002, 3000 ft, *CPD & Gross 1185* (UC). **Plumas:** on moist stream bank under dense shade along French Creek, eight mi SW of LaPorte, 2009, 3980 ft, *CPD & Toren 2588* (RMA).

Plagiomnium medium (Bruch & Schimper) T.J. Koponen Common; on moist soil at margins of creeks, spring and meadows. Sporophytes uncommon. **Butte:** on moist soil bank of creek underneath dense canopy near town of Brush Creek, 18 mi NE of Oroville, 2002, 2920 ft, *CPD 861* (RMA). **Plumas:** on saturated soils at edge of meadow, seven mi W of Thompson Peak, 2002, 2082 m, *CPD 1084* (UC); Quincy, 1934, 3500 ft, *Ikenberry 1415* (MO). **Sierra:** on moist soil in roadside ditch, near historical town site of Queen City, three mi SE of LaPorte, 2005, 4920 ft, *CPD 2329* (RMA).

Plagiomnium venustum (Mitten) T.J. Koponen Uncommon; on shaded rocks and soil on forest floor. Sporophytes uncommon. **Plumas:** on moist soil adjacent to cascading perennial creek, five mi E of East Quincy, 2004, 3794 ft, *CPD 1297* (UC); on dry rock talus 300 yards up river from Caribou Powerhouse, 15 mi NW of Quincy, 2006, 3000 ft, *CPD 2357* (RMA). **Sierra:** on soil underneath partial forest canopy, six mi S of LaPorte, 2005, 3920 ft, *CPD 1887* (RMA). **Yuba:** on rock adjacent to Brushy Creek, two mi E of Strawberry Valley and 27 mi E of Oroville, 2005, 3501 ft, *CPD 1945* (RMA).

Plagiothecium denticulatum (Hedwig) Schimper Uncommon; on saturated soil, wood or rock. Sporophytes common. **Plumas:** on saturated soil in splash zone of Joseph Creek, 12 mi E of Quincy, 2005, 6824 ft, *CPD 2074* (RMA); on damp soil at edge of small stream, two mi W of Bucks Lake, 2004, 5500 ft, *Toren 9340* (RMA). **Sierra:** on seeping wet rock face along tributary to Slate Creek, two mi S of LaPorte, 2005, 4680 ft, *CPD & Toren 2332* (RMA); on saturated soil at margin of spring in tributary to Potosi Creek, six mi NE of LaPorte, 2005, 5793 ft, *CPD & Toren 2307* (RMA).

Plagiothecium laetum Schimper Uncommon; on rotten logs in forest underneath dense canopy. Sporophytes common. **Butte:** on moist rotten log in riparian zone of tributary to Dogwood Creek, 16 mi E of Chico, 2005, 3820 ft, *CPD 1837* (Harpel). **Yuba:** on rotten old-growth conifer log in spray zone of cascading waterfall of Brushy Creek, 2.5 mi E of Strawberry Valley, 2005, 3400 ft, *CPD 1950* (RMA); on well rotted old-growth *Pseudotsuga menziesii* log in riparian zone, three mi E of Strawberry Valley, 2005, 3740 ft, *CPD 1959* (RMA).

Platydictya jungermannioides (Bridel) H.A. Crum Uncommon; on moist soil in springs. Sporophytes uncommon. **Plumas:** on saturated soil of spring in upper reaches of Boulder Creek, three mi SW of Thompson Peak and six mi SW of Janesville, 2002, 1654 m, *CPD 1091* (UC); on organic soils in spring, 16 mi E of Quincy, 2005, 6069 ft, *CPD 2142* (RMA); on moist soil in seep three mi E of Moonlight Peak and 10 mi NE of Greenville, 2005, 5803 ft, *CPD & Toren 2184* (RMA).

Pleuridium subulatum (Hedwig) Rabenhorst Rare; based on lack of collections, but probably undercollected; on soil in meadow opening in springtime. Sporophytes present on single collection. **Yuba:** on soil under grasses in small forest opening, three mi SE of Challenge, 2003, 2440 ft, *CPD 972* (UC).

Pohlia annotina* (Hedwig) Lindberg Rare; on soil. Sporophytes absent on both collections. **Yuba: on soil over rock near Joseph Creek, five mi SE of Challenge, 2010, 2050 ft, *Toren 9741* (DUKE); at Challenge Forest Service work center, 2010, 2560 ft, *Toren 9751* (DUKE).

Pohlia bolanderi (Lesquereux) Brotherus Uncommon; on damp rock crevices. Sporophytes absent on all three collections. **Plumas:** on soil over rock near Joseph Creek, 12 mi E of Quincy, 2005, 6331 ft, *CPD & Toren 2079* (DUKE); on damp rock crevice at edge of High Bench Fen on Mt Fillmore, 15 mi S of Quincy, 2006, 7000 ft, *Toren 9504a* (DUKE); on rock crevices, seven mi NE of LaPorte, 2009, 6320 ft, *Toren & CPD 9711* (CAS).

Pohlia camptotrachela (Renauld & Cardot) Brotherus Common; on moist mineral soils or soil over rock. Sporophytes uncommon. **Butte:** on shaded moist soil of old roadbank along Forest Rd 23N30, three mi E of Cresta, 2009, 4825 ft, *Toren 9717* (CAS). **Plumas:** on bare damp soil on eroded creek bank in headwaters of China Gulch Creek, five mi S of Bucks Lake, 2003, 5416 ft, *CPD 1044* (DUKE); on moist soil in middle of 100-acre opening of Walker Copper Mine tailings, 15 mi E of Quincy, 2006, 5760 ft, *CPD, Toren & Friend 2062* (RMA); on moist silty soils on roadside cutbank, 20 mi E of Quincy, 2005, 6515 ft, *CPD & Toren 2171* (RMA). **Sierra:** on clay soil at margin of headwaters of tributary to Gold Run Creek, five mi SW of LaPorte, 2005, 4570 ft, *CPD & Toren 1999* (RMA).

Pohlia cruda (Hedwig) Lindberg Common; on moist soil, wood or rock, often on stream margins. Sporophytes common. **Plumas:** on moist soil at edge of Cascade Creek, 13 mi E of Quincy, 2005, 6253 ft, *CPD & Toren 2080* (DUKE); on soil in crack of exposed rock along Stag Creek, 33 mi NE of Oroville, 2002, 1704 m, *CPD & Gross 911* (UC). **Sierra:** on moist vertical rock face at "Wink Eye Mine", six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2227* (DUKE). **Yuba:** on soil of eroded stream bank under dense forest canopy along Simon Ravine, 5.5 mi SW of LaPorte, 2005, 4120 ft, *CPD 1969* (DUKE).

***Pohlia flexuosa* Hooker Rare; on intermittently moist soil or rock. Gemmae abundant on collections. **Yuba:** on partly shaded, intermittently damp soil and soil over rock in fissures of vertical metamorphic rock, two mi E of Strawberry Valley, 2006, 4120 ft, *Toren 9496 & Toren 9544a* (CAS, DUKE, NY). Note: Shaw and Toren (2009) recognized this as the first and only collection in North America.

Pohlia nutans (Hedwig) Lindberg Common; on rock, wood or soil in a variety of habitats, including fens, road cuts, rotten wood under forest canopy and exposed rock outcrops. Sporophytes common.

Plumas: on moist soil and rotting wood underneath forest canopy along Grizzly Creek, two mi SW of Bucks Lake, 2004, 5157 ft, *CPD & Toren 1567* (RMA); on base of *Pinus contorta* at edge of fen growing with *Aulacomnium palustre*, Little Summit Lake, 17 mi E of Quincy, 2005, 5813 ft, *CPD 2111* (DUKE); on soil in rock crevice on rock face in road cut at Little Grass Valley Reservoir dam, 2009, 5060 ft, *CPD & Toren 2522* (DUKE). **Sierra:** on rock adjacent to Rock Creek at historic mining town of Union Hill, five mi S of LaPorte, 2005, 4042 ft, *CPD 1938* (RMA); on soil accumulated in crevice of rock outcrop along tributary to Cedar Grove Ravine, one half mi S of historic mining town of St. Louis, three mi E of LaPorte, 2005, 4961 ft, *CPD & Toren 2299* (RMA).

Pohlia wahlenbergii (F. Weber & D. Mohr) A.L. Andrews

Common; on wet rock, soil or wood, often around creeks in shade or diffuse light. One collection with sporophytes.

Butte: on *Alnus rhombifolia* roots in dripping stream, two mi NW of Forbestown, 2003, 1588 ft, *CPD 1092* (DUKE). **Plumas:** on moist soil at edge of Dolly Creek underneath dense conifer forest canopy, 16 mi E of Quincy, 2005, 6272 ft, *CPD, Toren & Friend 2051* (RMA). **Sierra:** on open, moist soil at edge of McNair Meadow where small stream enters, 1 mi W of Calpine, 2002, 1613 m, *CPD 625* (DUKE). **Yuba:** on moist soil along creek bank underneath dense forest canopy, five mi SW of LaPorte, 2005, 4360 ft, *CPD & Toren 1977* (RMA).

Polytrichum commune Hedwig

Common; on moist to wet soil, in areas with no canopy to closed canopy forests. One collection with sporophytes.

Butte: on soil, 2.5 mi S of community of Brush Creek, 2002, 3234 ft, *CPD 539* (UC). **Plumas:** on soil at edge of small stream in open meadow, two mi NW of Little Grass Valley Reservoir dam, 2002, 1685 m, *CPD & Gross 685* (RMA, Harpel); Bucks Lake, 1934, *Ikenberry 1418* (MO). **Sierra:** in seeping portion of creek, three mi E of LaPorte, 2005, 4961 ft, *CPD & Toren 2298* (RMA). **Yuba:** in roadside ditch, five mi SE of Challenge, 2010, 2000 ft, *Toren 9740A* (RMA).

Polytrichum juniperinum Hedwig

Common; on poor and disturbed soils, in meadow, road cut or forest habitats. Sporophytes uncommon.

Butte: on soil in recess of rock outcrop, two mi NW of Forbestown, 2003, 2420 ft, *CPD 1016* (RMA). **Plumas:** on forest soils underneath dense forest canopy in headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6743 ft, *CPD 1683* (RMA). **Sierra:** on dry upland soil, six mi S of LaPorte, 2005, 3800 ft, *CPD 1904* (RMA). **Yuba:** on dry forest soil, five mi SE of Challenge, 2003, 2340 ft, *CPD 966* (RMA).

Polytrichum longisetum Swartz ex Bridel

Rare; on disturbed soils. Sporophytes absent in single collection.

Yuba: on bare soil in roadside ditch, five mi SE of Challenge, 2010, 2000 ft, *Toren 9738* (CAS).

Polytrichum piliferum Hedwig

Uncommon; on poor soils in chaparral, often in forests with *Quercus chrysolepis* or *Quercus kelloggii*. No collections with sporophytes.

Butte: on soil over granite, 0.5 mi E of Cresta, 2006, 1560 ft, *CPD 2345* (RMA). **Plumas:** on dry rock outcrop, five mi E of East Quincy, 2004, 4040 ft, *CPD 1395* (RMA). **Sierra:** on shallow soil over rock, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2315* (RMA).

Porotrichum bigelovii (Sullivan) Kindberg

Common; on rock and soil in seeps and streams. No collections with sporophytes.

Butte: on thin duff over mineral soil adjacent to Lockerman Creek, 19 mi E of Chico, 2004, 3140 ft, *CPD & Toren 1795* (RMA). **Yuba:** on moist soil along creek bank underneath dense forest canopy, five mi SW of LaPorte, 2003, 2520 ft, *CPD & Toren 1193* (UC).

Pseudobraunia californica (Lesquereux) Brotherus

Uncommon; on dry rocks, underneath sparse to moderate forest canopy. Sporophytes common.

Butte: on dry ultramafic rock, 12 mi E of Chico, 2004, 3143 ft, *CPD & Toren 1828* (RMA); near Concow Dam, 1934, *Ikenberry 1213* (MO). **Plumas:** on dry, 40-foot tall rock outcrop in manzanita shrub field, eight mi NE of Quincy, 2004, 4363 ft, *CPD 1309* (RMA); on tree trunk, 1948, *Nantt s.n.* (MO). **Yuba:** on roadside soils, five mi SE of Challenge, 2003, 2220 ft, *CPD 958* (UC).

Pseudocalliergon angustifolium Hedenäs

Rare; on saturated wet meadow soils. Single collection without sporophytes.

Plumas: on saturated soil in open *Carex*-dominated wet meadow, three mi W of Thompson Peak, 2002, 6600 ft, *CPD 1078* (RMA).

Note: Determined in 2004 by Dillingham and Toren. Plant with central strand present and without inflated alar cells.

Pseudocampylium radicale (P. Beauvois) Vanderpoorten & Hedenäs

Rare; on moist wood. Specimens not examined for presence of sporophytes.

Plumas: on damp *Alnus tenuifolia* trunks at margin of fen at Blue Lake, three mi NW of Buck's Lake, 2006, 6300 ft, *Toren 9484* (CAS); on shaded damp fallen log at margin of fen, four mi SE of Bucks Lake, 2006, 4700 ft, *Toren 9500A with Janeway* (CAS).

Note: all of these collections were determined as *Amblystegium radicale* (Palisot de Beauvois) Schimper, but I am including them as *P. radicale* to follow Vanderpoorten (2014).

Pseudoleskea incurvata (Hedwig) Loeske

Rare; on dry rock outcrops at higher elevations. Sporophytes unknown in study area.

Plumas: on volcanic conglomerate rock outcrop underneath moderate forest canopy at margin of Blakeless Creek, 15 mi E of Quincy, 2005, 5951 ft, *CPD & Toren 2149* (RMA); on dry rock outcrop underneath moderate forest canopy, 19 mi E of Quincy, 2005, 6147 ft, *CPD & Toren 2175* (RMA).

Pseudoleskea patens (Lindberg) Kindberg

Common; on rock, bases of hardwood trees and on forest soils. Sporophytes uncommon.

Plumas: on dry rock outcrop underneath *Quercus vaccinifolia* shrubs, 11 mi W of Quincy, 2001, 5819 ft, *CPD, Hanson & Norris 418* (RMA); on exposed rock outcrop in Stag Creek drainage, 33 mi NE of Oroville,

2002, 1704 m, *CPD & Gross 913* (UC). **Sierra:** on boulder underneath moderate forest canopy, five mi E of LaPorte, 2005, 5280 ft, *CPD & Toren 2302* (RMA); on base of *Cornus sessilis* shrub on stream bank of Gold Run Creek underneath dense forest canopy, five mi SW of LaPorte, 2005, 4100 ft, *CPD & Toren 1993* (RMA). **Yuba:** on rock adjacent to tributary to Slate Creek, four mi SW of LaPorte, 2005, 4060 ft, *CPD 1973* (RMA).

Pseudoleskea radicata (Mitten) Macoun & Kindberg

Rare; on dry rock. Sporophytes unknown in study area.

Butte: on shaded limestone boulder along Forest Rd 23N30, three mi E of Cresta, 2009, 4500 ft, *Toren 9719* (CAS). **Plumas:** on granite boulder underneath dense forest canopy, in headwaters of Taylor Creek, nine mi NE of Quincy, 2005, 6743 ft, *CPD 1684* (UC).

Pseudoleskea stenophylla Renauld & Cardot

Uncommon; on bases of hardwoods and on rock. Sporophytes uncommon.

Plumas: on horizontal trunk of *Alnus incana* underneath dense forest canopy, 24 mi NE of Oroville, 2004, 4200 ft, *Toren 9349* (RMA); on metamorphic rock underneath sparse forest canopy, 1 mi W of LaPorte, 2005, 5369 ft, *CPD & Toren 2020* (RMA). **Yuba:** on base of *Alnus rhombifolia* underneath dense forest canopy, three mi E of Strawberry Valley, 2005, 3740 ft, *CPD 1960* (UC).

Pterigynandrum filiforme Hedwig

Common; on tree boles, branches and rock outcrops, generally underneath dense forest canopy. No collections with sporophytes.

Butte: on *Acer macrophyllum* tree bole, six mi E of community of Brush Creek, 2002, 3976 ft, *CPD 806* (UC). **Plumas:** on dry rock outcrop, 12 mi E of Quincy, 2005, 6331 ft, *CPD 2065* (RMA). **Sierra:** on rock boulder underneath dense forest canopy, three mi E of LaPorte, 2005, 4961 ft, *CPD & Toren 2297* (RMA). **Yuba:** on old-growth *Pseudotsuga menziesii* log, three mi E of Strawberry Valley, 2005, 3740 ft, *CPD 1958* (RMA).

Ptychomitrium gardneri Lesquereux

Uncommon; on dry rocks, underneath sparse to moderate forest canopy. Sporophytes common.

Butte: on serpentinite rock underneath sparse canopy, 16 mi E of Chico, 2004, 3010 ft, *CPD 1806* (RMA). **Plumas:** on rock in dry creek bed of Poplar Creek, four mi SW of Cromberg, 2007, 4880 ft, *CPD & Toren 2373* (RMA); on dry rock, 1/4 mi W of Belden, 2006, 2280 ft, *CPD, B. Shaw & J. Shevock 2361* (RMA).

Ptychostomum creberrimum (Taylor) J.R. Spence & H.P. Ramsay

[*Bryum liseae* De Notaris]

Uncommon; on rock along streambanks. Sporophytes common.

Plumas: on eroded rocky stream bank of ephemeral tributary to Middle Fork Feather River, 1.5 mi E of Graeagle, 2004, 4603 ft, *CPD & Toren 1723* (RMA); on rock outcrop on edge of Grassy Lake in open meadow, Lakes Basin, six mi SW of Graeagle, 2001, 6320 ft, *CPD, Hanson & Norris 408* (RMA, Spence); on dry stream bed, two mi S of Portola, 2002, 1648 m, *CPD & Gross 591* (UC, Spence); between Bucks Lake and Meadow Valley, 1934, *Ikenberry 1094* (MO). **Sierra:** on rock in Sulphur Creek, three mi WNW of Calpine, 2002, 1604 m, *CPD & Gross 620* (UC).

Ptychostomum pacificum J.R. Spence & Shevock

Common; on peat soils in fens or wet meadows. Sporophytes rare.

Plumas: on saturated peat soils in fen, 12 mi NW of Quincy, 2002, 1585 m, *CPD & Gross 889* (UC); on saturated soils in fen-like meadow near South Branch Ward Creek, 16 mi E of Quincy, 2005, 6671 ft, *CPD, Toren & Friend 2057* (CAS, UC); on saturated peat soils in Waters Fen, seven mi SW of Quincy, 2001, 5400 ft, *CPD, Hanson & Norris 404* (UC, Spence personal herbarium); on saturated peat soils in fen-like wetland, 7.5 mi NE of Quincy, 2004, 6287 ft, *CPD 1654* (CAS, UC, this is the only collection with sporophytes, dioicous). Note: this species is related to *Ptychostomum turbinatum* (Hedwig) J.R. Spence, but is distinguished by a combination of characters including large size, costa that ends at the leaf apex and with strongly recurved leaf margins. John Spence and Jim Shevock have recently described this species and cited specimens from this work (Spence and Shevock 2012).

Ptychostomum pseudotriquetrum (Hedwig) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pedersen

[*Bryum pseudotriquetrum* (Hedwig) G. Gäertner, B. Meyer & Scherbius]

Abundant; on saturated to ephemerally moist mineral soil, peat or soil over rock in fens, seeps, springs, streams and rock faces underneath forest canopy or in full sun. Sporophytes uncommon.

Butte: on vertical rock wall in seep, two mi NS of Forestown, 2004, 1588 ft, *CPD 1127* (Spence personal herbarium). **Plumas:** on rock in dry creek bed, eight mi NE of Greenville, 2001, 5400 ft, *CPD 477* (UC, Spence personal herbarium); on soil at edge of Grassy Lake, Lakes Basin, six mi SW of Graeagle, 2001, 6320 ft, *CPD, Hanson & Norris 443* (UC); on saturated soils in fen at Greens Flat Fen, 16 mi SW of Quincy, 2003, 5620 ft, *CPD & Toren 1231* (RMA). **Yuba:** on rock in seep at edge of Gold Run Creek underneath moderate forest canopy, five mi SW of LaPorte, 2005, 3975 ft, *CPD & Toren 1986* (RMA).

Ptychostomum weigeli (Sprengel) J.R. Spence

[*Bryum weigeli* Sprengel]

Common; on saturated soils in springs, wet meadows and fens under partial canopy to full sunlight. No collections with sporophytes.

Plumas: on moist soil in wet meadow adjacent to Grizzly Lake, two mi SW of Bucks Lake, 2003, 5150 ft, *CPD, Toren & Heep 1141* (RMA, Spence); on saturated soils in fen-like meadow near South Branch Ward Creek, 16 mi E of Quincy, 2005, 6671 ft, *CPD, Toren & Friend 2058* (RMA); on saturated soils in wet meadow in full sunlight, at margin of South Fork of Long Valley Creek, five mi E of Cromberg, 2004, 6074 ft, *CPD 1580* (RMA). **Yuba:** in moss-dominated spring feeding into tributary to Slate Creek underneath moderate forest canopy, four mi SW of LaPorte, 2005, 4200 ft, *CPD 1970* (RMA).

Rhizomnium glabrescens (Kindberg) T.J. Koponen

Common; on the shaded banks of creeks, wet soil over rocks or wet logs. Sporophytes uncommon. **Butte:** on silt-covered rock at edge of Lockerman Creek, 19 mi E of Chico, 2004, 3140 ft, *CPD 1776* (RMA); on rotten wet log at edge of creek in dense shade, 2002, 3790 ft, *CPD 768* (RMA). **Sierra:** on wet, seeping rock face under dense canopy, 2.5 mi S of LaPorte, 2005, 4680

ft, *CPD 2323* (RMA). **Yuba**: on old log laying partially submerged in Brush Creek underneath partial canopy, three mi E of Strawberry Valley and 27 mi E of Oroville, 2005, 3560 ft, *CPD 1957* (RMA).

Rhizomnium magnifolium (Horikawa) T.J. Koponen
Uncommon; on moist soil and stream banks. No collections with sporophytes.

Butte: on moist soil at margin of Lockerman Creek, 19 mi E of Chico and two mi NW of Cresta, 2004, 3140 ft, *CPD 1779* (RMA); on soil, 12 mi E of Paradise, 2009, 1450 m, *Toren & Rhoades s.n.* (CAS 1139082, CHSC 106163). **Plumas**: on streamside humus in Butterfly Valley Botanical Area, five mi NW of Quincy, 2002, 4000 ft, *Laeger 1587* (CAS); on wet shaded soil in hillside seep, north of Four Trees, five mi E of Cresta, 2009, 5100 ft, *Toren & Starkey 9725* (CAS).

Rhizomnium pseudopunctatum (Bruch & Schimper) T.J. Koponen
Uncommon; on saturated soils at fen edges and margins of streams and seeps, often in densely shaded sites. No collections with sporophytes.

Butte: on soil bank above stream, 14 mi W of LaPorte, 2003, 3861 ft, *CPD 773* (UC); on soil in seep under *Azalea*, 11 mi W of LaPorte, 2002, 3940 ft, *CPD 729* (UC). **Plumas**: on saturated organic soils in China Gulch Fen, five mi S of Bucks Lake Lodge, 2003, 5410 ft, *CPD 1040* (RMA); on moist soil in seep at headwaters of Bear Creek, six mi SW of Cromberg, 2007, 6320 ft, *CPD 2379* (RMA).

**Rhynchostegium aquaticum* A. Jaeger
Uncommon; on submerged rocks in creeks or in splash zones of waterfalls. Sporophytes common.

Butte: on rock under dripping water of three ft tall waterfall, 14 mi NE of Oroville, 2002, 2700 ft, *CPD & Gross 804* (UC, MO); on rock in Little Ram Creek, 1.5 mi N of town of Brush Creek, 2002, 2920 ft, *CPD & Gross 1179* (UC). **Plumas**: on rock submerged in Greenhorn Creek, 4.5 mi E of Quincy, 2004, 3700 ft, *CPD & Toren 1646* (RMA).

Note: Recent phylogenetic analysis by Ochyra (2012) reported in Ignatov (2014) indicates the segregate *Platyhypnidium riparioides* (Hedwig) Dixon is not warranted.

**Rhytidadelphus triquetrus* (Hedwig) Warnstorf
Rare; on moist soil in densely shaded sites. Neither collection with sporophytes.

Butte: on moist soil adjacent to small creek, 18 mi E of Chico and 1.5 mi W of Cresta, 2004, 3206 ft, *CPD and Toren 1751* (CAS). **Plumas**: on litter over soil in dry draw, 1 mi SW of Meadow Valley Cemetery, 2003, 3860 ft, *CPD 928* (CAS).

Roellobryon roellii (Brotherus) Ochyra
Common; on organic forest soils and litter in shaded sites. No collections with sporophytes.

Plumas: on moist soil adjacent to small unnamed creek, nine mi WSW of Quincy, 2001, 5200 ft, *CPD 697* (CAS); on dry soil in shaded site S of Grizzly Creek, three mi SE of Storrie, 2003, 4640 ft *CPD & Swartz 1223* (CAS). **Sierra**: on moist soil under dense canopy, six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2241* (CAS).

Note: This taxa was previously known as *Roellia roellii* (Brotherus ex Roll) Andrews ex Crum in Norris and Shevock (2004a).

Rosulabryum canariense (Bridel) Ochyra
[*Bryum canariense* Bridel]
Uncommon; on soil and rock. Sporophytes uncommon.

Butte: on red clay soils on roadcut underneath partial forest canopy, two mi E of Concow Reservoir and 16 mi E of Chico, 2004, 2897 ft, *CPD & Toren 1799* (Spence personal herbarium); on rock underneath sparse forest canopy, 12 mi E of Chico, 2004, 3098 ft, *CPD & Toren 1824* (RMA); on shaded recess of dry, ultramafic-derived rock, 12 mi E of Chico, 2004, 3143 ft, *CPD & Toren 1830* (RMA).

Rosulabryum capillare (Hedwig) J.R. Spence
Uncommon; on soil and rock underneath sparse to dense forest canopy. Sporophytes common.

Butte: on saturated rock in streambed, two mi NW of Forbestown, 2003, 2070 ft, *CPD 1019* (RMA). **Plumas**: on dry forest soil along tributary to Little Grizzly Creek, 13 mi E of Quincy, 2005, 5201 ft, *CPD 2121* (RMA); on damp soil in riparian zone two mi W of Portola, 2002, 4960 ft, *CPD 572* (UC). **Yuba**: on soil of logging road underneath sparse forest canopy, six mi SE of Challenge, 2003, 2800 ft, *CPD 964* (CAS).

Rosulabryum gemmascens (Kindberg) J.R. Spence
Uncommon; on soil and rock under forest canopy. Sporophytes in one of two collections.

Butte: on eroded bank of Ram Creek, two mi NE of Brush Creek community, 2002, 2920 ft, *CPD & Gross 1170* (UC). **Plumas**: on moist vertical rock wall adjacent to tributary to Greenhorn Creek, seven mi E of Quincy, 2004, 3794 ft, *CPD 1290* (RMA, Spence personal herbarium).

Rosulabryum torquescens (Bruch & Schimper) J.R. Spence
Rare; on disturbed soils. No sporophytes on single collection.

Plumas: on soils in disturbed area underneath partial forest canopy at Belden Rest Area, 16 mi NW of Quincy, 2006, 2260 ft, *CPD, Shaw & Kellman 2440* (RMA).

Sanionia uncinata (Hedwig) Loeske
Uncommon; on rocky seeps and splash zones of creeks. One collection with sporophytes.

Plumas: on rock outcrop along Grizzly Creek in shaded site, two mi SW of Bucks Lake, 2004, 5028 ft, *CPD, Toren & Friend 1557* (CAS); on stream boulder in splash zone of Cascade Creek, 13 mi E of Quincy, 2005, 6472 ft *CPD & Toren 2096* (CAS); on seep over rock under closed canopy forest along Rabbit Creek, 1 mi W of LaPorte, 2005, 4890 ft, *CPD & Toren 2031* (CAS).

Schistidium agassizii Sullivant & Lesquereux
Rare; on seasonally submerged rock. Single collection with sporophytes.

Plumas: on seasonally submerged rock in headwaters of tributary to Lost Creek, 1.5 mi W of LaPorte, 2009, 5110 ft, *CPD & Toren 2607* (CAS); on rocks in dry rivulet in Lakes Basin Recreation Area, 2013, 6450 ft, *Shevock 42889* (CAS).

Schistidium ambiguum Sullivant
Rare; on rock. Specimen not examined for presence of sporophytes.

Plumas: on metamorphic rock approximately 1.5 mi S of Bucks Lake, 2009, 5700 ft, *Toren 9710* (CAS, determined by Hans Blom).

**Schistidium atrichum* (Müller Hal. & Kindberg) W.A. Weber

Rare; on soil over rock. Single collection without sporophytes.

Plumas: on soil over volcanic breccias conglomerate rock out crop at margin of Blakeless Creek, 15 mi E of Quincy, 2005, 5951 ft, *CPD & Toren 2148* (CAS).

Schistidium cinclidodonteum (Müller Hal.) B. Bremer
Common; on periodically submerged or seasonally wet rocks. Sporophytes common.

Plumas: on rocks in dry stream bed of Grizzly Creek, two mi SW of Bucks Lake, 2003, 5150 ft, *CPD, Toren & Heep 1146* (UC, CAS); on rock in dry creek bed, two mi S of Portola, 2003, 1612 m, *CPD & Gross 594* (CAS, UC); on rock ephemerally submerged in Long Valley Creek, 20 mi E of Quincy, 2005, 6370 ft, *CPD & Toren 2166* (CAS). **Sierra:** on ephemerally submerged rock along Potosi Creek, 1/4 mi N of Howland Flat and six mi E of LaPorte, 2005, 5619 ft, *CPD & Toren 2234* (CAS). **Yuba:** on sunny concrete water tank of old abandoned campground, five mi S of Challenge, 2010, 2300 ft, *Toren 9747* (CAS).

Note: Two Plumas County collections, *CPD 581 & CPD 583* (both at CAS) were of a short-awned form, previously described as *Schistidium pacificum* (E. Lawton) Ochyra. Including *S. pacificum* as a synonym of *S. cinclidodonteum* follows the current treatment by McIntosh (2007).

Schistidium occidentale (E. Lawton) S.P. Churchill
Uncommon; on periodically submerged rocks. Sporophytes common.

Plumas: on rock cobble in dry stream bed at headwaters of Taylor Creek, nine mi NE of Quincy, 2004, 6345 ft, *CPD & Toren 1673* (CAS); on rock, periodically inundated in stream bed of Long Valley Creek, four mi E of Cromberg, 2004, 5845 ft, *CPD 1571* (CAS).

Schistidium rivulare (Bridel) Podpěra
Common; on periodically submerged rocks. Sporophytes common.

Plumas: on rocks in headwaters of Cascade Creek, 13 mi E of Quincy, 2005, 6472 ft, *CPD & Toren 2104* (RMA); on rock in dry stream, two mi SW of Bucks Lake, 2003, 5150 ft, *CPD, Toren & Heep 1145* (UC); on seasonally inundated rock in stream bed, six mi WSW of Portola, 2002, 4500 ft, *CPD & Gross 635* (Harpel). **Sierra:** on rock in intermittent stream channel, 5.5 mi NE of LaPorte, 2005, 5417 ft, *CPD & Toren 2304* (RMA). **Yuba:** on rock submerged in Gold Run Creek, five mi SW of LaPorte, 2005, 3975 ft, *CPD & Toren 1989* (RMA).

Schistidium splendens T.T. McIntosh, H.H. Blom, D.R. Toren & Shevock

Common; on periodically submerged or seasonally wet rocks. Sporophytes common.

Butte: on ultramafic rock in sheet drainage area of bedrock 12 mi E of Chico, 2004, 3098 ft, *CPD & Toren 1810* (UBC). **Plumas:** on volcanic rock adjacent to streambed, above stream flow, three mi NE of Graeagle, 2004, 5191 ft, *CPD & Toren 1705* (BC); on rock ephemerally submerged in Dolly Creek, 16 mi E of Quincy, 2005, 6272 ft, *CPD, Toren & Friend 2055* (CAS). **Sierra:** on sheet drainage area of steep narrow bedrock gorge in Cedar Grove Ravine, 1/2 mi S of St. Louis and three mi E of LaPorte, 2005, 4745 ft, *CPD &*

Toren 2291 (UBC). **Yuba:** on rock in ephemeral stream channel in headwaters of Little Oregon Creek, two mi S of Challenge, 2003, 2700 ft, *CPD 995* (CAS, UC).

Note: Determined by Blom to represent a new species related to *S. cinclidodonteum* (McIntosh et al. 2015). The leaf lacks the long-channeled apex that is present on *S. cinclidodonteum*.

***Schistidium subjulaceum* H.H. Blom

Rare; single collection on seasonally inundated rocks along stream.

Plumas: on shaded rock in dry streambed, three mi S of Antelope Lake, 12 mi SE of Janesville, 2005, 5384 ft, *CPD 2212 & Toren* (CAS).

Note: collection was determined by Terry McIntosh in July 2014, as a new species to California.

Scleropodium cespitans (Müller Hal.) L.F. Koch

Rare; on clay soils and wood. Single collection examined without sporophytes.

Plumas: on exposed *Calocedrus* roots, along Dixie Canyon Rd, 1997, 1300 m, *Shevock, Ertter & Morosco 15731* (CAS). **Yuba:** on clay soils in bare patches of lawn, Forest Service station at Challenge, 2010, 2560 ft, *Toren 9752* (UC).

Scleropodium obtusifolium (Mitten) Kindberg

Abundant; on seasonally inundated rocks along streams, in seeps and in splash zones of waterfalls and cascading creeks. Most perennial riparian zones in the study area have this plant. Sporophytes rare.

Butte: on wet vertical rock wall in riparian zone, two mi NW of Forbestown, 2003, 1588 ft, *CPD 1095* (UC).

Plumas: on rock in flowing water, three mi E of Portola, 2002, 4960 ft, *CPD 574* (UC); on rock in dry streambed, two mi W of Little Grass Valley Reservoir, 2002, 5460 ft, *CPD 751* (UC). **Sierra:** on rock in seep underneath dense forest canopy, six mi S of LaPorte, 2005, 3800 ft, *CPD 1903* (UC). **Yuba:** on rock in splash zone of perennial tributary to Dry Creek, 1 mi S of Challenge, 2003, 2520 ft, *CPD 1192* (UC).

Note: one collection of a morph listed in Norris and Shevock (2004b) as "species A" was collected: **Plumas:** 24 mi NE of Oroville in unnamed tributary to South Branch Middle Fork Feather River, 2003, 1171 m, *CPD 746* (UC). This morph has rigid stems and leaves wider than long. Carter (2012b, 2014a) was unable to find any molecular differences between *S. obtusifolium* and "species A" and suggested that "species A" represents the extreme end of the broad spectrum of morphological variation typical of many aquatic bryophytes".

Scleropodium occidentale B.E. Carter

Rare; single collection on seasonally inundated rocks along stream.

Plumas: on rock in dry streambed, two mi W of Little Grass Valley Reservoir, 2002, 5460 ft, *CPD 751* (UC); on rock in small stream, Feather River Canyon, Plumas National Forest, 1979, no elevation available, *Norris 52600* (UC).

Note: *S. occidentale* was described by Carter (2012b) after the majority of the fieldwork for this flora was completed and included *Norris 52600* in his list of specimens examined. It may be more common in lower elevations along relatively smaller and drier drainages in oak dominated habitats as compared to habitats used by *S. obtusifolium* (B. Carter personal com-

munication 2014). Sporophytes not present on single collection.

Scleropodium touretii (Bridel) L.F. Koch

Common; on trailside and roadside banks in forest. Sporophytes uncommon.

Butte: on dry soil on road cutbank underneath sparse forest canopy, three mi N of Forbestown, 2003, 2250 ft, *CPD 1097* (UC) **Plumas:** on seepy sandstone in open scabland with sparse forest canopy, two mi N of Graeagle, 2004, 5529 ft, *CPD 1467* (UC). **Yuba:** on roadside soils underneath moderate forest canopy, five mi SE of Challenge, 2003, 2220 ft, *CPD 957* (UC, Harpel personal herbarium); on *Pseudotsuga* in forest campground above Bullard Bar Dam, 1975, 2000 ft, *Weber B-48297* (MO); on gravelly serpentine, 3.1 km S of Woodleaf, 810 m, *Janeway & Williams 10793* (CAS).

*****Scopelophila ligulata* (Spruce) Spruce**

Rare; on roadside cutbank of mineral rich soils. No sporophytes at known site.

Plumas: on mineral soils in seep on roadside cutbank through phyllite rock type, five mi E of Twain and 1/8 mi north of Paxton in Feather River Canyon, 2004, 2993 ft, *Toren & Dillingham 9351* (CAS, MO, UC) and *CPD 1836* (CAS, Harpel personal herbarium,) and *Shevock 28933* (CAS).

Note: This was the first collection of this species in California.

Scouleria aquatica Hooker

Uncommon; aquatic species growing on rock under running streams. No collections with sporophytes.

Plumas: on rock in dry stream bed near Gold Lake, 11 mi W of Quincy, 2001, 6010 ft, *CPD, Hanson & Norris 438* (UC); underwater on rock in perennial stretch of Poplar Creek, four mi SW of Cromberg, 2007, 4760 ft, *CPD & Toren 2374* (RMA); on rock under flowing water in tributary to Cashman Creek, seven mi NE of Quincy, 2004, 5906 ft, *CPD 1418* (RMA). **Sierra:** on rock in ephemeral stream channel underneath moderate forest canopy, five mi E of LaPorte, 2005, 5280 ft, *CPD & Toren 2303* (RMA).

Scouleria marginata E. Britton

Rare; aquatic species growing on rock under running streams. Specimen not examined for presence of sporophytes.

Plumas: on rock at Indian Falls of Indian Creek, 11 mi W of Quincy, 1955, 2800 ft, *Lawton 3132* (MO).

*****Sphagnum angustifolium* (Warnstorf) C.E.O. Jensen**

Rare, this is the only record in California, on saturated fen soils. No collections with sporophytes.

Sierra: on saturated peat soils underneath moderate forest canopy in a fen with *Darlingtonia californica*, four mi S of LaPorte, 2005, 4540 ft, *CPD 2335* (UC, CAS, CHSC, NY, determined by Flatberg Feb 2006 and verified by Dillingham and Jon Shaw Feb 2007).

Sphagnum capillifolium (Ehrhart) Hedwig

Rare, on moist peat soils under shrubs. No collections with sporophytes.

Plumas: Along unnamed tributary to Mill Creek in Bucks Lake Wilderness, persisting underneath *Kalmia* shrubs in cattle trampled meadow, 2001, 5960 ft, *CPD 460*, (NY) (determined by Shaw).

Note: determined as *S. russowii* Warnstorf by Andrus (Jan 2004), but Jon Shaw and Dillingham agree that it is *S. capillifolium* (Feb 2007).

Sphagnum miyabeianum Warnstorf

Uncommon, on saturated fen soils. This is the most common *Sphagnum* on the Plumas NF. No collections with sporophytes.

Plumas: Silver Lake Fen adjacent to Bucks Lake Wilderness, on saturated soils mixed with *Aulacomnium palustre*, 2001, 5900 ft, *CPD 427* (NY, determined by Andrus) and *CPD 435* (NY) and *Shaw 13697-13721* (DUKE); Blue Lake Fen, Bucks Lake Wilderness, on saturated peat soils in *Menyanthes trifoliata* dominated fen with pH of 5.4, 2004, *Belsher-Howe s.n. 17 Aug 2004* (NY); Waters Fen E of Tamarack Flat, in cattle trampled fen mixed with *Meesia triquetra*, 2002, 5400 ft, *CPD 816*, (NY, determined by Andrus); Along unnamed tributary to Mill Creek in Bucks Lake Wilderness, persisting underneath *Kalmia* shrubs in cattle trampled meadow, 2001, 5960 ft, *CPD 459*, (NY, determined by Andrus); Helgrammite Lake, on saturated soils and partially submerged at edge of small pond, 2002, *CPD 1137*, (NY, Determined by Andrus).

Note: *S. subsecundum* Nees in Sturm collections from California have recently been determined to represent the species *Sphagnum miyabeianum* (Shaw et al. 2014). Therefore, all *S. subsecundum* specimens from this study are being named *S. miyabeianum*. Two specimens (duplicates at NY) previously determined as *S. mendocinum* Sullivant (*CPD 435* and *Belsher-Howe s.n.*) by Andrus were determined as *S. subsecundum* (now *S. miyabeianum*) by Dillingham and Jon Shaw, Feb 2007.

Sphagnum squarrosum Crome

Uncommon, on saturated fen soils. No collections with sporophytes.

Plumas: Willow Lake in Lassen NF, on floating mat of vegetation, 2004, 5800 ft, *CPD 1650* (NY, verified by Andrus); Rogers Lake, two mi W of Bucks Lake, 2006, 5400 ft, *Toren 9510* (CAS, determined by Janssens); Plumas N.F., specimen not located, 2004, *Bishop s.n.*, (NY, determined by Janssens).

Sphagnum teres (Schimper) Ångström ex Hartman

Rare; on saturated soils in fen. Single collection reviewed without sporophytes.

Plumas: all collections from Willow Lake fen, 16 mi NW of Chester, 5800 ft; 1893, *R.M. Austin s.n. with Bruce* (NY, determined by Andrus); 1898 *Bruce 2398* (NY determined by Andrus); 2002, *Sanger s.n. 19 July 2002* (RMA, determined by the author).

Straminergon stramineum (Dickson ex Bridel) Hedenäs

Rare, on saturated fen soils. No collections with sporophytes.

Plumas: on wet, slightly raised rotted log, imbedded in *Sphagnum* fen, Rogers Lake, S of Grizzly Lake, two mi SW of Bucks Lake, 2006, 5350 ft, *Toren 9508* (CAS) also collected same day and locality by *Janeway 8938* (CHSC); Willow Lake fen, 16 mi NW of Chester, 1897, 5800 ft, *R.M. Austin s.n.* (NY).

Syntrichia latifolia (Bruch ex Hartman) Huebener

Rare; single collection on concrete. Single collection with sporophyte.

Yuba: on sunny concrete water tank of old abandoned campground, five mi S of Challenge, 2010, 2300 ft, *Toren 9746* (RMA).

Syntrichia montana Nees

Rare; on concrete. Sporophytes present on single collection.

Yuba: on sunny concrete water tank of old abandoned campground, five mi S of Challenge, 2010, 2300 ft, *Toren 9746* (RMA).

Note: Although this species was not in the catalogue of California mosses (Norris and Shevock 2004a), it is not considered new to California because it is listed in both Mishler (2007) and Malcolm et al. (2009) as occurring in California.

Syntrichia norvegica F. Weber

Rare, on open exposed soils at higher elevations. One of two collections with sporophytes.

Plumas: on dry rock outcrop within mixed conifer forest between Rogers and Grizzly Lakes, two mi SW of Bucks Lake, 2003, 5220 ft, *CPD, Toren & Heep 1156*, (RMA); on exposed volcanic conglomerate rock outcrop above headwaters of Cascade Creek, 13 mi E of Quincy, 2005, 625 ft, *CPD & Toren 2086* (RMA, verified by Kellman).

Syntrichia princeps (De Notaris) Mitten

Common; on rocks, soil and tree trunks. The most common *Syntrichia* species in the study area. Sporophytes common.

Butte: on soil underneath dense mixed coniferous forest, at Brush Creek Guard Station in community of Brush Creek, 2002, 3551 ft, *CPD 514* (UC). **Plumas:** on forested slope underneath mixed conifer forest, two mi E of Portola, 2002, 5240 ft, *CPD 577* (UC). **Sierra:** on shaded boulder near Gibson Creek, five 1/2 mi NE of LaPorte, 2005, *CPD & Toren 2258* (RMA). **Yuba:** on *Quercus kelloggii* trunk in mixed coniferous and deciduous forest, six mi SE of Challenge, 2003, 2740 ft, *CPD 947* (UC).

Syntrichia ruralis (Hedwig) F. Weber & D. Mohr

Common; on rocks, soil and seeps. Sporophytes common.

Plumas: on granite rock outcrop, six mi SW of Portola, 2002, 1491 m, *CPD 555* (UC); on moss-covered base of monolithic 50-ft tall vertical conglomerate volcanic rock with calcium deposits, 13 mi E of Quincy, 2005, 6452 ft, *CPD 2098* (RMA); in seep on rock wall, five mi E of East Quincy, 2005, 3794 ft, *CPD 1292* (RMA).

Syntrichia species A

Uncommon; on rocks. Sporophytes common.

Plumas: on dry granitic rock outcrop, 13 mi SE of Janesville, 2005, 4677 ft, *CPD & Toren 2200* (RMA).

Sierra: on rock outcrop underneath dense forest canopy at Little Rock Creek/Rock Creek confluence, six mi S of LaPorte, 2005, 3800 ft, *CPD 1900* (CAS, determined by Kellman).

Note: This undescribed species is characterized by strap-shaped leaves, the very wide costa at the base, the margins recurved at most to 3/4 leaf, but often less, lack of hydroids, a relatively narrow sterile band that reaches the apex of the leaf, thick-walled guide and abaxial costal cells, and the moist leaves at most spreading, not squarrose like *S. ruralis*.

Timmiella crassinervis (Hampe) L.F. Koch

Common; on soil under forest canopy. Sporophytes uncommon.

Butte: on soil in tributary to Sucker Run Creek, 15 mi E of Oroville, 2003, 2780 ft, *CPD 1025* (RMA, Harpel).

Plumas: on soil over wood along headwaters of Cascade Creek, 13 mi E of Quincy, 2005, 6472 ft, *CPD 2092* (RMA). **Sierra:** on clay soil at margin of headwater tributary to Gold Run Creek, five mi SW of LaPorte, 2005, *CPD & Toren 1998* (RMA).

Tortula hoppeana (Schultz) Ochrya

[*Tortula euryphylla* R.H. Zander]

Uncommon; on soil or on soil over rock in full sun. Sporophytes common.

Plumas: on dry, rocky soil near base of volcanic conglomerate rock outcrop, 13 mi E of Quincy, 2005, 6452 ft, *CPD 2102* (MO); in crevice of large rock outcrop, 11 mi E of Quincy, 2005, 6914 ft, *CPD 2118* (RMA); on soil pocket in volcanic conglomerate rocky cobble in poorly vegetated landscape, 16 mi E of Quincy, 2005, 6476 ft, *CPD & Toren 2155* (RMA).

Tortula subulata Hedwig

Uncommon; on moist creek banks to soil in dry rock outcrop crevices. Sporophytes common.

Plumas: on forest floor adjacent to thimbleberry patch, S side of Marion Ravine, 1998, 4800 ft, *Janeway 5702* (MO); on wet soil on creek bank of Black Gulch, eight mi W of Quincy, 2002, 4000 ft, *Gross & CPD 893* (UC). **Sierra:** on soil of upturned root wad underneath dense forest canopy adjacent to Little Rock Creek, six mi S of LaPorte, 2005, 3920 ft, *CPD 1875* (RMA).

Trichodon cylindricus (Hedwig) Schimper

Uncommon; on disturbed soil. Sporophytes uncommon.

Plumas: on disturbed soil of upturned root wad along headwaters of Middle Creek, three mi W of Antelope Lake and 13 mi SW of Janesville, 2005, 5990 ft, *CPD 2220* (RMA); on moist soil adjacent to Onion Creek, 10 mi E of LaPorte, 2007, 6300 ft, *CPD 2351* (RMA); on dry soil of roadside cutbank under forest canopy near South Fork of Long valley Creek, four mi E of Cromberg, 2004, 5845 ft, *CPD 1575* (RMA); on moist silty soils in entrance to mountain beaver (*Aplodontia rufa*) burrow in Long Valley Creek drainage, 20 mi E of Quincy, 2005, 6587 ft, *CPD & Toren 2174* (RMA). **Sierra:** on moist soil of roadside ditch near historical town site of Queen City, three mi SE of LaPorte, 2005, 4920 ft, *CPD 2275* (RMA).

Warnstorfia exannulata (Schimper) Loeske

Rare; on wet soil. Sporophytes absent on single collection.

Plumas: on wet, but not saturated soil, in full sun at Bucks Lake Fen, 2005, 6060 ft, *Bishop s.n. 25 Aug 2005* (Janssens personal herbarium, RMA).

Weissia controversa Hedwig

Uncommon; on soil. Sporophytes common.

Butte: on red clay soils on roadcut under forest canopy, 16 mi E of Chico and two mi E of Concow Reservoir, 2004, 2897 ft, *CPD & Toren 1800* (RMA). **Plumas:** on moist soil under short grass, five mi NE of Quincy, 2004, 4329 ft, *CPD 1313* (RMA); on rock 1 mi W of Onion Valley, eight mi NE of LaPorte, 2008, 6100 ft, *Toren 9645* (MO). **Sierra:** on shallow soil over rock adjacent to Canyon Creek, five mi SE of LaPorte, 2005, 4200 ft, *CPD & Toren 2314* (RMA).

Zygodon rupestris Schimper ex Lorentz

Rare; on tree trunk of hardwoods. Single collection without sporophytes.

Yuba: on shaded trunk of *Acer macrophyllum*, on Oregon Hill Rd two mi S of Challenge, 2010, 2700 ft, Toren 9759 (RMA).

APPENDIX 2

EXCLUDED SPECIES

Eurhynchium striatum (Schreber ex Hedwig) Schimper. Revaluation was completed on two specimens cited in Norris and Shevock (2004a), CPD 965 and CPD 747 by B. Allen, D. Toren, J. Harpel (personal communication 2004) and the author. Specimen CPD 965 was determined as *Kindbergia praelonga* (Hedwig) Ochyra by Allen and the author. Specimen CPD 747 (CAS) has been determined as *Brachythecium frigidum* (Muller Hal) Beschereille by Harpel, Toren, and the author.

Imbriobryum gemmiparum (De Notaris) J.R. Spence. Revaluation of a specimen (Norris 69975) cited in Norris and Shevock (2004a) as *Bryum gemmiparum* De Notaris by Toren in April 2015 revealed that it was *I. torenii* J.R. Spence & Shevock.

APPENDIX 3

Possible additions to the Flora: these have been found in the Sierra Nevada Mountain Range, north of Highway 50 north to the vicinity of Lassen National Park and National Forest or in the foothills and grasslands in Butte, Yuba, and Tehama counties. Additional species were included if communications with other bryologists, particularly David Toren, suggested suitable habitat on Plumas National Forest.

Acaulon rufescens A. Jaeger – known from Sierra County, Tahoe N.F.

Aloina aloides var. *ambigua* (Bruch & Schimper) E.J. Craig – potential habitat on Plumas National Forest.

Andreaea nivalis Hooker – known from Lassen and Yosemite N.P.

Andreaea rupestris Hedwig – throughout Sierras.

Barbula unguiculata Hedwig – Butte County, three mi E of Palermo.

Bartramia aprica Müller Hal. – Nevada County, Hwy 20 about seven mi W of Rough and Ready.

Brachythecium rutabulum (Hedwig) Schimper – Sierra County, Tahoe N.F.

Crossidium squamiferum (Viviani) Juratzka – potential habitat on Plumas National Forest.

Dicranella howei Renauld & Cardot – Nevada County, Tahoe N.F., Butte County, Lake Oroville.

Dicranella varia (Hedwig) Schimper – apparently suitable habitat on Plumas National Forest.

Dicranum fuscescens Turner – potential habitat on Plumas National Forest.

Entosthodon californicus (Sullivant & Lesquereux) H.A. Crum & L.E. Anderson – per Toren.

Ephemerum serratum (Schreber ex Hedwig) Hampe – apparently suitable habitat on Plumas National Forest.

Fissidens curvatus Hornschuch – Butte County, Big Chico Creek.

Fontinalis hypnoides Hartman – Nevada County, Bowman Lake; Plumas County, headwaters of Feather River.

Funaria muhlenbergii Turner – potential habitat on Plumas National Forest.

Gemmabryum gemmilucens (R. Wilczek & Demaret) J.R. Spence – Butte County, north of Gridley.

Gymnostomum aeruginosum Smith – Tehama County: bluff overlooking Battle Creek near Mantion, Norris 21339 (cited in Norris and Shevock 2004a).

Gymnostomum viridulum – apparently suitable habitat on Plumas National Forest.

Hennediella stanfordensis (Steere) Blockeel – potential habitat on Plumas National Forest.

Homalothecium arenarium (Lesquereux) E. Lawton – Tehama County, Hwy 36 E of Red Bluff.

Microbryum davallianum (Smith) R.H. Zander – Butte County, Lime Saddle Marina, five mi W of Forest Boundary.

Microbryum starckeanum (Hedwig) R.H. Zander – Tehama County, 10 mi E of Red Bluff.

Mnium arizonicum J.J. Amann – Known from Southern Sierras north to Modoc County.

Orthotrichum lyellii Hooker & Taylor – found by Lake Oroville at Lime Saddle. All specimens examined by author were *O. papillosum*. Additional specimens labeled as this taxon occur at NY that have not been reviewed.

Orthotrichum norrisii F. Lara, R. Medina & Garilleti – potential habitat on Plumas National Forest.

Phascum cuspidatum Schreber ex Hedwig – Shasta County, Hwy 299 E of Redding.

Pohlia longibracteata Brotherus – Nevada County, Hwy 20, Tahoe N.F.

Pseudocrossidium obtusulum (Lindberg) H.A. Crum & L.E. Anderson – Placer County, Hwy 49.

Pseudotaxiphyllum elegans (Bridel) Z. Iwatsuki – Kings Creek, Lassen Volcanic National Park.

Schistidium flaccidum (De Notaris) Ochyra – Shasta County, Warner Valley, Lassen Volcanic N.P.

Scleropodium julaceum E. Lawton – potential habitat on Plumas National Forest.

Tortula atrovirens (Smith) Lindberg – potential habitat on Plumas National Forest.

Tortula muralis Hedwig – Lassen County, Hwy 139.

APPENDIX 4

MOSSES BY HABITAT

Tree bark: *Alsia californica*, *Antitrichia californica*, *Brachytheciastrum velutinum*, *Claopodium bolanderi*, *Dendroalsia abietina*, *Dicranoweisia cirrata*, *Homalothecium nuttallii*, *Hypnum circinale*, *Isothecium cristatum*, *Isothecium stoloniferum*, *Neckera menziesii*, *Neckera douglasii*, *Orthodicranum tauricum*, *Orthotrichum obtusifolium*, *Orthotrichum papillosum*, *Nogopterium gracile*, *Syntrichia princeps*, *Zygodon rupestris*.

Leaf litter: *Kindbergia oregana*, *Leucolepis acanthoneura*, *Homalothecium megaptitum*.

Rotting wood on Forest Floor: *Amblystegium serpens*, *Aulacomnium androgynum*, *Brachytheciastrum velutinum*, *Buxbaumia viridis*, *Claopodium crispifolium*, *Dicranoweisia cirrata*, *Isothecium cristatum*, *Isothecium stoloniferum*, *Orthodicranum tauricum*.

Forest Soils: *Atrichum selwynii*, *Brachythecium albicans*, *Brachytheciastrum velutinum* var. *salicinum*, *Rosulabryum canariense*, *Rosulabryum capillare*, *Claopodium bolanderi*, *Claopodium whippleanum*, *Epipterygium tozeri*, *Kindbergia praelonga*, *Fissidens crispus*, *Porotrichum bigelovii*, *Timmiella crassinervis*, *Weisia contro-versa*.

Fens: *Aulacomnium palustre*, *Brachythecium salebrosum*, *Campylium polygamum*, *Cratoneuron filicinum*, *Drepanocladus aduncus*, *Drepanocladus polycarpon*, *Drepanocladus sordidus*, *Meesia triquetra*, *Meesia uliginosa*, *Ptychostomum pacificum*, *Ptychostomum pseudotriquetrum*, *Ptychostomum weigelii*, *Sphagnum angustifolium*, *Sphagnum capillifolium*, *Sphagnum miyabeianum*.

Springs and Seeps: *Amblystegium serpens*, *Aulacomnium palustre*, *Brachythecium frigidum*, *Bruchia bolanderi*, *Campylium polygamum*, *Cratoneuron filicinum*, *Crumia latifolia*, *Drepanocladus aduncus*, *Drepanocladus polycarpon*, *Imbribryum miniatum*, *Imbribryum muehlenbeckii*, *Ptychostomum pseudotriquetrum*, *Ptychostomum weigelii*, *Rosulabryum gemmascens*.

Submerged in Streams: *Crumia latifolia*, *Dichodontium pellucidum*, *Drepanocladus aduncus*, *Fissidens bryoides*, *Fissidens grandifrons*, *Fissidens ventricosus*, *Hygrohypnum bestii*, *Imbribryum miniatum*, *Imbribryum muehlenbeckii*, *Rhynchostegium aquaticum*.

Creek banks and stranded rocks in creek beds: *Atrichum selwynii*, *Brachythecium frigidum*, *Imbribryum muehlen-*

beckii, *Claopodium whippleanum*, *Codriophorus acicularis*, *Dichodontium pellucidum*, *Didymodon norrisii*, *Epipterygium tozeri*, *Eurhynchium pulchellum*, *Fissidens bryoides*, *Fissidens crispus*, *Fissidens grandifrons*, *Fissidens pauperculus*, *Fissidens ventricosus*, *Grimmia lisae*, *Kindbergia praelonga*, *Leucolepis acanthoneura*, *Neckera menziesii*, *Mnium marginatum*, *Pohlia longibracteata*, *Pohlia wahlenbergii*, *Porothamnium bigelovii*, *Rhizomnium glabrescens*, *Scleropodium obtusifolium*.

Disturbed Places and very poor soil: *Anomobryum julaceum*, *Barbula convoluta*, *Bryum argenteum*, *Ceratodon purpureus*, *Dicranella rufescens*, *Didymodon vinealis*, *Fissidens sublimbatus*, *Funaria hygrometrica*, *Polytrichum juniperinum*, *Rosulabryum canariense*, *Rosulabryum torquescens*, *Timmiella crassinervis*.

Shaded or Moist Rocks: *Amphidium californicum*, *Anacolia baueri*, *Bartramia ithyphylla*, *Blindia acuta*, *Brachythecium albicans*, *Hygrohypnum ochraceum*.

Dry and exposed Rocks: *Anacolia menziesii*, *Andreaea heinemannii*, *Brachytheciastrum collinum*, *Bryum calobryoides*, *Rosulabryum canariense*, *Gemmabryum violaceum*, *Bucklandiella heterosticha*, *Dendroalsia abietina*, *Didymodon insulanus*, *Didymodon norrisii*, *Didymodon vinealis*, *Frisvollia varia*, *Grimmia anomala*, *Grimmia hamulosa*, *Grimmia laevigata*, *Grimmia leibergii*, *Grimmia lisae*, *Grimmia montana*, *Grimmia pulvinata*, *Grimmia ramondii*, *Grimmia reflexidens*, *Grimmia serrana*, *Grimmia torquata*, *Grimmia trichophylla*, *Hedwigia stellata*, *Homalothecium nuttallii*, *Isothecium cristatum*, *Isothecium stoloniferum*, *Orthotrichum rupestre*, *Pseudobraunia californica*, *Ptychomitrium Gardneri*, *Syntrichia princeps*.

Concrete and pavement: *Bryum argenteum*, *Bryum lanatum*, *Ceratodon purpureus*, *Funaria hygrometrica*, *Grimmia pulvinata*, *Homalothecium nuttallii*, *Hygroamblystegium tenax*, *Syntrichia latifolia*, *Syntrichia montana*, *Syntrichia ruralis*.

Lawn Weeds or in Irrigated Gardens: *Ceratodon purpureus*, *Funaria hygrometrica*, *Scleropodium cespitosum*.

Winter Ephemerals: very little work has been done surveying grasslands in early spring in this area. *Pleuridium subulatum*.

Grasslands: *Bryum argenteum*, *Ceratodon purpureus*, *Didymodon vinealis*, *Ditrichum schimperi*, *Fissidens sublimbatus*, *Funaria hygrometrica*, *Pleuridium subulatum*, *Polytrichum juniperinum*.

A MOSS FLORA OF LAKE COUNTY, CALIFORNIA

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ABSTRACT

The moss flora of Lake County, California comprises of 300 species and one variety within 111 genera. This represents 44 percent of the California moss flora occupying an area less than one percent of the state land area. Six species, *Bryum veronense* De Notaris, *Gemmabryum kunzei* (Hornschuch) J.R. Spence, *Schistidium flaccidum* (De Notaris) Ochyra, *Tortella alpicola* Dixon, *Trichodon cylindricus* (Hedwig) Schimper, and *Trichostomum brachydontium* Bruch were documented as new for California. Four species, *Acaulon mediterraneum* Limpricht, *Funaria convexa* Spruce, *Gymnostomum viridulum* Bridel and *Schistidium echinatum* Ignatova & H.H. Blom, were documented as new records for the North American moss flora. During this study, thirteen species were described as new to science with at least one occurrence documented from Lake County: *Didymodon californicus* J.A. Jiménez, D.R. Toren & Shevock, *D. eckeliae* R.H. Zander, *D. norrisii* R.H. Zander, *Gemmabryum vinosum* J.R. Spence & Kellman, *Grimmia serrana* Muñoz, Shevock & D.R. Toren, *G. torenii* R.I. Hastings, *Homalothecium californicum* Hedenäs, Huttunen, D.H. Norris & Shevock, *Imbriobryum torenii* J.R. Spence & Shevock, *Orthotrichum persimile* F. Lara, R. Medina & Garilleti, *Ptychostomum pacificum* J.R. Spence & Shevock, *Schistidium splendens* T.T. McIntosh, H.H. Blom, D.R. Toren & Shevock, *S. squarrosus* T. T. McIntosh, H.H. Blom, D.R. Toren & Shevock and *Scleropodium occidentale* B.E. Carter.

Key Words: Biodiversity, bryogeography, bryophytes, California Floristic Province.

Lake County, California, located in the central portion of the northern Coast Ranges and about midway between the Pacific Ocean and the Sacramento Valley, is named for Clear Lake, the largest natural freshwater body wholly within the state (Fig. 1). It was formed in 1861 from parts of Mendocino and Napa counties, but the area had settlers from at least the 1840s. Its neighboring counties are Mendocino, Sonoma, Napa, Yolo, and Glenn. The total area of the county is about 1329 mi² (slightly larger than the state of Rhode Island), of which 71.52 mi² is water. According to the 2010 U.S. census, the population is 64,665. The elevational range covers nearly 6500 ft, the lowest point 620 ft on Putah Creek at the Napa County line to the highest point, 7056 ft at the summit of Snow Mountain. Other mountains in the northern part of the county located within the Mendocino National Forest are Sheetiron Mountain (6503 ft), Hull Mountain (6873 ft), Goat Mountain (6121 ft), and the southern flanks of Mt. Sanhedrin, whose summit is in Mendocino County with an elevation of 6175 ft. There are three major drainage systems within the county. In the northern portion the Eel River has its origin and flows to its mouth in Humboldt County. Stony Creek, which flows to the Sacramento Valley, has its headwaters on Snow Mountain. In the central portion, the main streams, which flow into Clear Lake, are Middle Creek, Forbes Creek, Adobe Creek, Scotts Creek, and Kelsey Creek. Cache Creek, which flows to the Sacramento River, has two forks, one of which is the outlet of Clear Lake and the other is the north fork which

is dammed to form Indian Valley Reservoir. The southern portion of the county is drained by Putah Creek. A few of its tributaries are St. Helena Creek, Anderson Creek, Dry Creek, and Soda Creek. There are both federal and state protected areas located in the county, and collection permits were obtained for the collecting and inventorying mosses in these areas. The Mendocino National Forest, administered by the U.S. Forest Service, has about 375 mi² within Lake County, and these federal lands stretch from the mountains east of the town of Lucerne on Clear Lake to the northernmost portion of the county on Kneecap Ridge. Within the National Forest is the Snow Mountain Wilderness, a federally designated wilderness area created by the passing of the California Wilderness Act of 1984, which designated about 37,000 acres. In 2006 the California Coastal Wild Heritage Wilderness Act was signed into law adding nearly 24,000 acres to the wilderness, presently totaling 60,076 acres. Part of this area is in Colusa and Glenn counties. The other federal lands are the Bureau of Land Management's 50,000 acre Cow Mountain Recreation Area, part of which is in Mendocino County. The Cache Creek Wilderness and Cache Creek Wildlife Area are located in eastern Lake County, the latter cooperatively managed by the Bureau of Land Management and the California Department of Fish and Game. The BLM also owns many small parcels scattered throughout the county. State protected areas include Clear Lake State Park at the north base of Mt. Konocti, Boggs Mountain Demonstration State Forest near Cobb Mountain, and Rodman

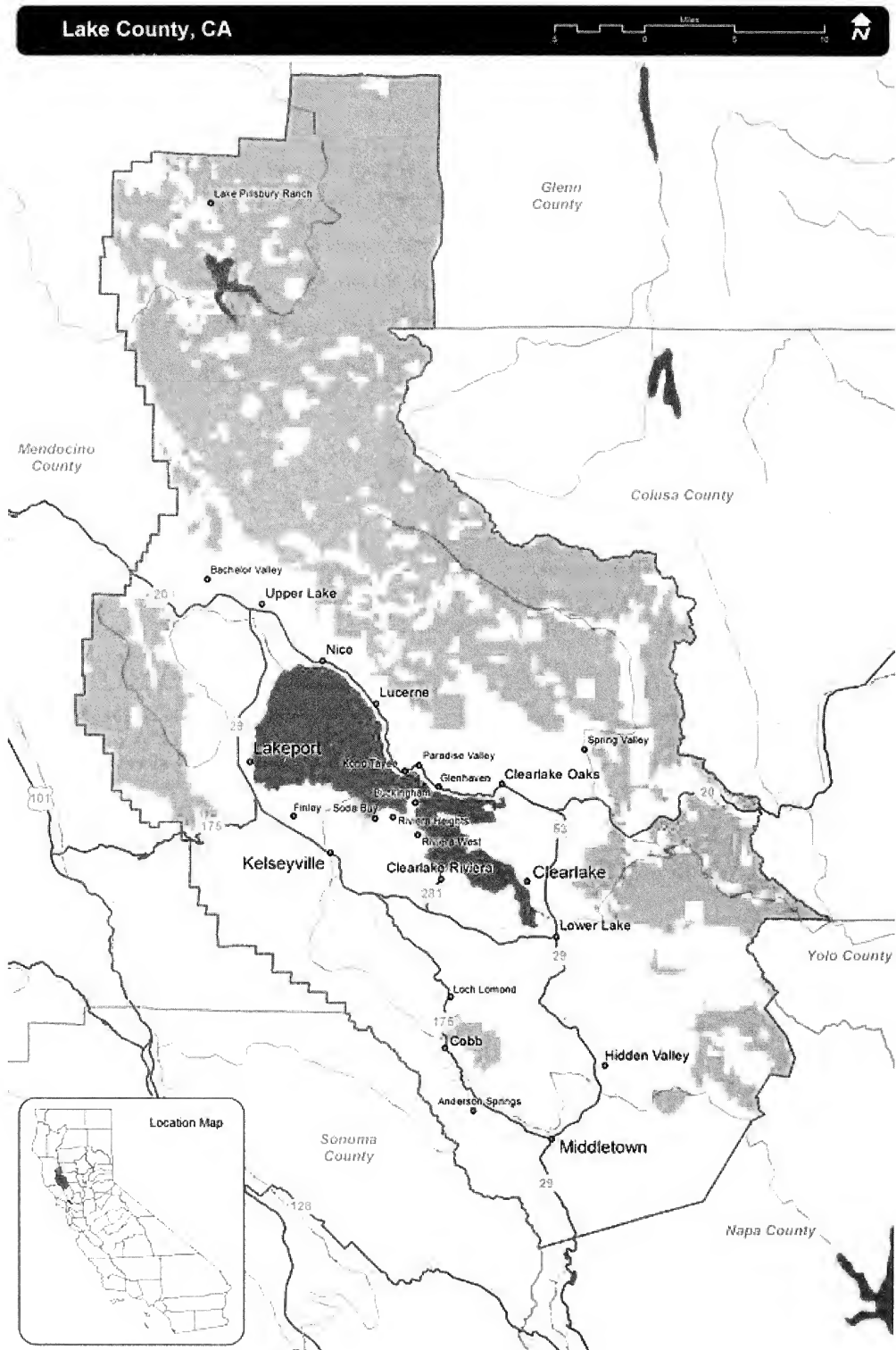


FIG. 1. Map of Lake County, California. Shaded areas represent public lands.

Slough Preserve, the major northern inlet to Clear Lake. These three areas were visited numerous times in order to collect voucher specimens. Four other state protected areas were visited briefly: Anderson Marsh State Historic Park, Robert Louis Stevenson State Park (Lake County portion), Loch Lomond Vernal Pool Ecological Reserve, and Boggs Lake Ecological Reserve.

CLIMATE

The climate of Lake County is essentially Mediterranean, characterized by cool, wet winters and warm, dry summers. Daily temperatures may vary as much as 40° or 50°F. Marine fogs rarely penetrate the western boundaries of the county, contributing to low relative humidity during the summer months. Largely due to the effects of topography annual precipitation is higher in the western and mountainous parts. Annual average precipitation at Boggs Mountain (Cobb Mountain area) is 71 inches. The towns of Lakeport, Clearlake, Kelseyville, and Upper Lake receive an average of 37, 32, 30, and 34 inches respectively. Precipitation in the form of snow can occur throughout the area but usually melts quickly, except on the highest mountains where it may persist until summer.

GEOLOGY

The geology of the county is very complex, consisting of an array of formations of different ages (Jennings and Strand 1960). One of the largest of these is the Franciscan complex, dating from the Jurassic Period and consists largely of sandstone, shale, greenstone, chert, and scattered outcroppings of pillow basalt. Marine sedimentary rocks of the Great Valley Group, also of Jurassic and Cretaceous ages, are another major formation in the area east of Clear Lake (Enderlin 2007). Scattered formations of serpentinized ultramafic rocks associated with the Franciscan complex are another abundant rock type. Quaternary alluvium and lake deposits also occur around Big Valley, Kelseyville, and Lower Lake. The northernmost of a number of volcanic fields in coastal California is termed the Clear Lake Volcanics. The youngest part of this field located near Clearlake Oaks and Sulphur Bank Mine is thought to be less than 40,000 years old (Enderlin 2007). The most prominent volcanic peaks are Cobb Mountain (4724 ft), Mt. Konocti (4305 ft), Boggs Mountain (3750 ft), Siegler Mountain (3635 ft), and Mt. Hannah (3980 ft). Rock types of these formations include andesite, dacite, rhyolite, obsidian, and olivine basalt (Chapman 1975). Clear Lake, with its 68 mi² of surface area, is believed to be the oldest lake in North America, and is geologically termed a structural basin (Enderlin 2007). It sits on a huge block of stone, which slowly tilts in the northern direction at the same rate as the lake fills in with

sediment, thus keeping the water at roughly the same depth. This process called subsidence is continuing. Indeed, if it were not for this process, the lake would have filled in with sediment long ago (Enderlin 2007).

PLANT COMMUNITIES

Following the classifications of Munz and Keck (1970), the vegetation types of Freshwater Marsh, Coniferous Forest, Mixed Evergreen Forest, Woodland-Savanna, and Chaparral occur within the county and these are divided into several plant communities. Some of these vegetation types are often discontinuous when topographical and edaphic factors are considered.

The Freshwater Marsh is dominated by *Cephalanthus occidentalis* L. var. *californicus* Benth., *Salix exigua* Nuttall, *S. gooddingii* C. Ball, *Scirpus acutus* Bigelow, and *Typha latifolia* L. Mosses frequently found are *Drepanocladus aduncus* (Hedwig) Warnstorf, *D. polygamus* (Schimper) Hedenäs, *Fissidens fontanus* (Bachelot de la Pylaie) Steudel, and *Leptodictyum riparium* (Hedwig) Warnstorf.

The Coniferous Forest is represented by Yellow Pine Forest, Douglas-Fir Forest, and Red Fir Forest. The first of these is named for its dominant, *Pinus ponderosa* Laws., which covers considerable area at middle elevations and often has admixtures of *Arbutus menziesii* Pursh. and *Quercus kelloggii* Newberry. The dominant understory species are *Arctostaphylos manzanita* C. Parry, *Ceanothus integerrimus* Hooker & Arnott, and *Toxicodendron diversilobum* (Torrey & A. Gray) E. Greene. The dominant moss species are *Brachytheciastrum velutinum* (Hedwig) Ignatyov & Huttunen, *Dicranoweisia cirrata* (Hedwig) Lindberg, *Homalothecium nuttallii* (Wilson) A. Jaeger, and *Grimmia trichophylla* Greville.

The Douglas-Fir Forest, dominated by *Pseudotsuga menziesii* (Mirbel) Franco is a more restricted community occurring mostly on north slopes and canyon bottoms in the northern portion of the county. The understory includes *Cornus nuttallii* Audubon, *Corylus cornuta* Marsh. var. *californica* (A. DC.) W. Sharp, and *Rubus parviflorus* Nuttall. Some mosses of the Douglas-Fir Forest are rare or even absent in other plant communities in the county. Some examples are *Dicranum fuscescens* Turner, *D. howellii* Renauld & Cardot, *Plagiothecium laetum* Schimper, and *Trachybryum megaptitum* (Sullivan) W.B. Schofield.

The Red Fir Forest, dominated by *Abies magnifica* A. Murray, occurs only on two peaks in Lake County, Hull Mountain and Snow Mountain (Griffin and Critchfield 1972). Frequent associates in this community are *Abies concolor* (Gordon & Glend.) Lindley and *Calocedrus decurrens* (Torrey) Florin, with some scattered stands of *Pinus jeffreyi* Greville & Balfour. Shrubs such as

Arctostaphylos patula E. Greene, *Ceanothus cordulatus* Kellogg, and *Symphoricarpos mollis* Nuttall grow in the understory or in forest openings. This community supports several wet meadows dominated by *Veratrum californicum* Durand and an assemblage of bryophyte species that are rare or absent at lower elevations.

The Mixed Evergreen Forest is a community that is often mixed with Yellow Pine Forest but is more species rich with such members as *Quercus berberidifolia* Liebm., *Q. chrysolepis* Liebm., and *Umbellularia californica* (Hooker & Arnott) Nuttall. Common mosses in this community are *Antitrichia californica* Sullivant ex Lesquereux, *Dendroalsia abietina* (Hooker) E. Britton ex Brotherus, *Homalothecium nuttallii*, *Orthotrichum lyellii* Hooker & Taylor, and *Timmiella crassinervis* (Hampe) L. F. Koch.

The major community of the Woodland Savanna Vegetation type is the Foothill Woodland, which covers large areas of rolling hills and valley borders at low to middle elevations, often with an abundance of intermittent streams. The typical woody plants are *Aesculus californica* (Spach.) Nuttall, *Cercis occidentalis* Torrey, *Pinus sabiniana* Douglas, *Quercus douglasii* Hooker & Arnott, and *Q. wislizenii* A. DC. Some of the most interesting but inconspicuous mosses of this community grow on soil among grasses and other herbaceous plants in late winter and early spring. These ephemerals include *Acaulon muticum* (Hedwig) Müller Hal., *Entosthodon californicus* (Sullivant & Lesquereux) H.A. Crum & L.E. Anderson, *Ephemerum serratum* (Hedwig) Hampe, *Phascum cuspidatum* Hedwig, and *Pleuridium acuminatum* Lindberg.

Chaparral is a vegetation type dominated by shrubby species with evergreen leathery foliage and often-spiny branches, occurring on dry ridges with rocky, heavy soils. The vegetation is mostly impenetrable but is strongly adapted to periodic fires, following which many of the shrubs tend to stump sprout. This community consists of *Adenostoma fasciculatum* Hooker & Arnott, *Ceanothus cuneatus* (Hooker) Nuttall, *Cercocarpus betuloides* Torrey & A. Gray, *Heteromeles arbutifolia* (Lindley) Roemer, *Pickeringia montana* Nuttall, and *Rhamnus californica* Eschscholtz. Occasionally, stands of the fire dependent *Pinus attenuata* Lemmon associate with chaparral shrubs. Mosses of this community are more plentiful where openings occur naturally (eroded gullies or rock outcrops) or man-made (roadbanks), although a few species may be epiphytic in old-growth chaparral. Species of Bryaceae and the genera *Grimmia*, *Orthotrichum*, and *Syntrichia* dominate the moss component of this community.

COLLECTION HISTORY

Although there is a rich history of bryophyte collecting in California (Thiers and Emory 1992),

relatively few records of mosses were documented for Lake County before this study. The earliest records are collections by Henry Bolander, who was employed as a botanical assistant for the State Geological Society in the 1860's. Unfortunately, many of Bolander's collection localities are vague and in some cases suspect, but Clear Lake was given as the locality for many species of mosses (Watson 1880). Volney Rattan was a prolific collector of vascular plants and collected *Drepanocladus aduncus* near Clear Lake in 1863. No other records were found until 1922 when T.C. Frye collected *Racomitrium varium* Mitten [= *Codriophorus varius*] near Adams Springs (Bednarek-Ochyra 2006). In 1925 Alice Eastwood of the California Academy of Sciences collected six specimens at Dashiells Ranch on the southern flanks of Mt. Sanhedrin. W. B. Schofield visited Lake County with John Hunter Thomas in 1966 and obtained 20 specimens (W. B. Schofield, personal communication). These specimens are housed at UBC. When Leo Koch published his annotated checklist of 317 mosses for California (Koch 1950), no specimens were specifically cited from Lake County even though general distributions in California for many taxa were given. Daniel Norris began a systematic study of California mosses soon after his arrival at Humboldt State in 1967 and collected in Lake County several times.

METHODS

Moss collections were initiated in Lake County by the author in 1971 and this became the topic of a master's thesis completed under the guidance of Harry D. Thiers at San Francisco State University (Toren 1977). This thesis reported 151 mosses from about 50 localities. This number was subsequently modified to 146 due to changes in species circumscription and specimen misidentifications. In 1997, collecting mosses resumed. In 1998, I began employment as a botanist with the U.S. Forest Service, Mendocino National Forest for six successive seasons. This work involved surveying for sensitive vascular plants, bryophytes and lichens. This opportunity enabled access many more remote areas and resulted in finding four additional county records. The main references used for identification were Grout (1928–1940), Lawton (1971), Flowers (1973), Sharp et al. (1994), Heyn and Hernnstadt (2004), and more recently selected treatments within volumes 27 and 28 of Flora of North America Editorial Committee (2007, 2014). Problematic specimens were sent to appropriate experts for verification or determination. Both habitat and locality information were included on herbarium labels. In some cases elevations were obtained from USGS topographic maps, and more recently from Google Earth. Field collecting for this flora ended in the spring of 2015, at which time 300 moss species

TABLE 1. SYNOPSIS OF THE MOSS GENERA AND FAMILIES OCCURRING IN LAKE COUNTY.

Amblystegiaceae	<i>Amblystegium</i> <i>Cratoneuron</i> <i>Hygroamblystegium</i>		<i>Ditrichum</i> <i>Pleuroidium</i> <i>Trichodon</i>		<i>Pohlia</i> <i>Rhizomnium</i> <i>Bryolawtonia</i>
	<i>Leptodictyum</i>	Encalyptaceae	<i>Encalypta</i>	Neckeraceae	<i>Metaneckera</i>
Andreaeaceae	<i>Andreaea</i>	Ephemeraceae	<i>Ephemerum</i>		<i>Neckera</i>
Archidiaceae	<i>Archidium</i>	Fabroniaceae	<i>Fabronia</i>		<i>Porotrichum</i>
Aulacomniaceae	<i>Aulacomnium</i>	Fissidentaceae	<i>Fissidens</i>	Orthotrichaceae	<i>Orthotrichum</i>
Bartramiaceae	<i>Anacolia</i> <i>Bartramia</i> <i>Philonotis</i>	Fontinalaceae	<i>Fontinalis</i>		<i>Zygodon</i>
		Funariaceae	<i>Entosthodon</i> <i>Funaria</i>	Plagiotheciaceae	<i>Plagiothecium</i>
Brachytheciaceae	<i>Brachytheciastrum</i> <i>Brachythecium</i> <i>Eurhynchiastrum</i> <i>Homalothecium</i> <i>Kindbergia</i> <i>Oxyrrhynchium</i> <i>Rhynchostegium</i> <i>Sciuro-hypnum</i> <i>Scleropodium</i> <i>Trachybryum</i>		<i>Physcomitrella</i> <i>Physcomitrium</i> <i>Bucklandiella</i> <i>Codriophorus</i> <i>Coscinodon</i> <i>Grimmia</i> <i>Niphotrichum</i> <i>Schistidium</i>	Polytrichaceae	<i>Atrichum</i> <i>Meiotrichum</i> <i>Polytrichum</i>
		Grimmiaceae	<i>Codriophorus</i> <i>Coscinodon</i> <i>Grimmia</i> <i>Niphotrichum</i> <i>Schistidium</i>	Pottiaceae	<i>Acaulon</i> <i>Aloina</i> <i>Barbula</i> <i>Bryoerythrophyllum</i> <i>Crossidium</i> <i>Crumia</i> <i>Didymodon</i> <i>Eucladium</i> <i>Gymnostomum</i> <i>Hennediella</i> <i>Hymenostylium</i> <i>Microbryum</i> <i>Phascum</i> <i>Pseudocrossidium</i> <i>Syntrichia</i> <i>Timmiella</i> <i>Tortella</i> <i>Tortula</i> <i>Trichostomum</i> <i>Weissia</i>
Bruchiaceae	<i>Bruchia</i>	Hedwigiaceae	<i>Hedwigia</i> <i>Pseudobraunia</i> <i>Rhytidiadelphus</i> <i>Hypnum</i> <i>Isopterygiopsis</i> <i>Platydictya</i>		
Bryaceae	<i>Bryum</i> <i>Gemmabryum</i> <i>Imbriobryum</i> <i>Plagiobryoides</i> <i>Ptychostomum</i> <i>Rosulabryum</i>	Hypnaceae	<i>Bestia</i> <i>Isothecium</i>		
	<i>Conardia</i> <i>Drepanocladus</i> <i>Hygrohypnum</i>	Lembophyllaceae	<i>Alsia</i> <i>Claopodium</i> <i>Pseudoleskea</i> <i>Antitrichia</i> <i>Nogopterium</i> <i>Leptobryum</i>		
Campyliaceae	<i>Dendrocladia</i> <i>Dendrocladus</i> <i>Dicranella</i> <i>Dicranum</i> <i>Orthodicranum</i> <i>Ceratodon</i>	Leptodontaceae	<i>Alsia</i> <i>Claopodium</i> <i>Pseudoleskea</i> <i>Antitrichia</i> <i>Nogopterium</i> <i>Leptobryum</i>		
		Leskeaceae	<i>Alsia</i> <i>Claopodium</i> <i>Pseudoleskea</i> <i>Antitrichia</i> <i>Nogopterium</i> <i>Leptobryum</i>		
Cryphaeaceae	<i>Dendrocladia</i> <i>Dendrocladus</i> <i>Dicranella</i> <i>Dicranum</i> <i>Orthodicranum</i> <i>Ceratodon</i>	Leucodontaceae	<i>Alsia</i> <i>Claopodium</i> <i>Pseudoleskea</i> <i>Antitrichia</i> <i>Nogopterium</i> <i>Leptobryum</i>		
Dicranaceae	<i>Dendrocladia</i> <i>Dendrocladus</i> <i>Dicranella</i> <i>Dicranum</i> <i>Orthodicranum</i> <i>Ceratodon</i>	Meesiaceae	<i>Alsia</i> <i>Claopodium</i> <i>Pseudoleskea</i> <i>Antitrichia</i> <i>Nogopterium</i> <i>Leptobryum</i>		
		Mielichhoferiaceae	<i>Mielichhoferia</i> <i>Epipterygium</i> <i>Leucolepis</i> <i>Mnium</i> <i>Plagiomnium</i>	Pterigynandraceae	<i>Pterigynandrum</i>
Ditrichaceae	<i>Ceratodon</i>	Mniaceae	<i>Mielichhoferia</i> <i>Epipterygium</i> <i>Leucolepis</i> <i>Mnium</i> <i>Plagiomnium</i>	Ptychomitriaceae	<i>Ptychomitrium</i>
				Rhabdoweisiaceae	<i>Amphidium</i>
				Scouleriaceae	<i>Scouleria</i>
				Seligeriaceae	<i>Dicranoweisia</i>

and one variety were documented for Lake County. Voucher specimens for pre-1977 moss collections are deposited at SFSU, with a few duplicates placed at CAS. Lake County collections obtained since 1997 are deposited at CAS.

RESULTS AND DISCUSSION

Approximately 2900 specimens were examined during the course of this study, of which the author collected the vast majority. With 301 known taxa within 111 genera, Lake County has a very rich moss flora considering it occupies less than 1% of the land area in California. Presently, there are 655 species of mosses documented for the state (Jim Shevock, personal communication). Thus, 44 percent of the state moss flora is known from Lake County. Another surprising result is that 100 taxa, or roughly 1/3 of the flora, are known from only one or two localities. The six largest moss families in Lake County by their respective numbers of species are: Pottiaceae (57), Bryaceae (42), Grimmiaceae (32), Brachytheciaceae (27), Orthotrichaceae (20), and Mniaceae (14). It is interesting to note that these are also

the six largest moss families for California (Norris and Shevock 2004a), however, the order is slightly different. A synopsis of the moss genera and families occurring in the county is provided in Table 1.

It may appear from the present catalogue an excessive number of species were given the abundance rating “rare”. This was due to a variety of reasons. First, a rare moss species in Lake County may be rare in California. Secondly, many taxa were only encountered once. Species considered rare in the county may be more frequent in other parts of the state due to such factors as relative humidity, or more abundant, suitable habitats determined by edaphic, hydrologic, or other conditions. Nevertheless, the presence of rare taxa contributes to the floristic diversity of the area. Though the county is located entirely within the Northwest Region of the California Floristic Province (Hickman 1993), it has a high species diversity largely due to climatic and geological conditions, and includes elements characteristic of floristic areas from the north, south, east, and west. From the north, a number of mosses reach their southern limits of distribution within Lake County and the

Northwest Region. Some examples are *Homalothecium californicum*, *Ptychostomum pacificum*, *Rhytidadelphus triquetrus*, *Trachybryum megapitum*, and *Trichodon cylindricus*. A number of mosses more commonly encountered in southern California were documented from Lake County and here approach their northernmost localities. Some of these are *Bestia longipes*, *Crossidium squamiferum*, *Imbricbryum microchaeton*, *Plagiobryoides vinosula*, and *Scleropodium californicum*. Along the eastern portions of the county, several mosses characteristic of the eastern slope of the Sierra Nevada and Great Basin occur. These include species such as *Brachythecium rivulare*, *Coscinodon calyptratus*, *Grimmia anodon*, *Imbricbryum mildeanum*, *Schistidium flaccidum*, *Syntrichia caninervis*, and *Syntrichia papillosissima*. From the west, several species adapted to areas of higher humidity along the coast are represented by few collections from small populations, often growing under suboptimal conditions. These include *Alsia californica*, *Bryolawtonia vancouveriensis*, *Neckera douglasii*, *Pohlia longibracteata*, and *Plagiothecium laetum*. Anthropogenic habitats, those influenced by human intervention, have added to the species diversity albeit many mosses of these habitats are presumably introduced. Several of these are discussed in Appendix 1. Parks, buildings, lawns, bedding plant areas, concrete bridge abutments, quarries, and even non-native trees may host numerous mosses that are rare or absent in natural settings. Some examples of these are *Barbula unguiculata*, *Brachythecium acutum*, *Campylopus introflexus*, *Didymodon umbrosus*, *Hennediella stanfordensis*, *Rosulabryum rubens*, *Tortula muralis*, and *T. papillosa*. The statewide rarities *Bryum veronense* and *Tortula brevissima* were found only once on concrete abutments. Road banks and agricultural areas often support a characteristic ruderal flora, and most species are small acrocarps. Many small species of Bryaceae occur in these habitats and several have vegetative propagules such as rhizoidal tubers and leaf-axis bulbils. Even smaller and shorter-lived specialists of disturbed soil are ephemerals such as *Acaulon muticum*, *Ephemerum serratum*, and *Phascum cuspidatum*. Mosses of disturbed soil are actually benefited by periodic substrate alteration, which provides new areas for colonization. A suite of 20 higher elevation species constituting the only Lake County records occurs on Snow Mountain and vicinity. These are listed in Appendix 2.

CONSERVATION IMPLICATIONS

Although there is a high species diversity of mosses in Lake County, there are several species, which are rare in the county and also in California. Many are unlikely to be found without specific searching. In 2001, bryophytes were first included by the California Native Plant Society's Inventory of Rare and Endangered Plants (6th

edition, 2001). Appendix 3 includes a list of taxa occurring in Lake County for which statewide conservation efforts have been applied.

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APPENDIX 1

Catalogue of Lake County mosses. In this catalogue, taxa are arranged alphabetically by genus followed by the family in parens. One of four subjective abundance ratings (common, occasional, infrequent, and rare) is assigned. Abundance ratings are based on the author's field observations of the respective taxon within Lake County and may not be parallel for the entire State of California. A brief habitat description is given for each taxon, followed by up to four localities with their collection numbers. Many taxa entries are concluded with comments regarding features of recognition, comparisons and contrasts with similar species, and bryogeographical, ecological, or nomenclatural information. Unless otherwise stated, collection numbers are those of the author. Cited specimens are housed at the herbarium of the California Academy of Sciences (CAS) unless listed otherwise. Specimens with the abbreviation "MNF" preceding the collection number are those collected from the Mendocino National Forest. The abbreviation "BLM" refers to collections made on Bureau of Land Management lands. One asterisk (*) preceding the scientific name indicates the first confirmed specimen from California; two asterisks (**) indicates the first record from North America. Nomenclature follows volumes 27 and 28 of *Flora North America* Editorial Committee (2007, 2014) with a few exceptions. Names that differ from those used by this author are placed in brackets at the end of the taxon entry.

****Acaulon mediterraneum*** Limpricht (Pottiaceae) Rare. On bare or sparsely vegetated soil in sun. Highland Springs reservoir south of Lakeport, edge of parking area below dam, 10321 (ver. by J. Guerra); Upper Lake Ranger Station west of barracks, 9352b. The former cited specimen is the apparently the first verified record for this moss in North America. According to Stone (1988), the spore ornamentation appears to be the most useful diagnostic feature in the *A. muticum* group. In *A. mediterraneum*, the spore coat is distinctly echinulate-spinulose whereas in *A. rufescens* the ornamentation is smooth to low-papillose and often with bare spots. Sérgio (1972) treated this taxon as *Acaulon muticum* var. *mediterraneum* (Limpricht) C. Sérgio. More recent workers Stone (1988), Guerra and Cano (2000), Jiménez et al. (2002), Hassel (2003), and Sabovljevic (2006) have recognized *A. mediterraneum* as a distinct species.

Acaulon rufescens A. Jaeger. (Pottiaceae). Rare. On sunny, bare soil, sometimes in chaparral. Indian Valley Lake near dam, Norris 67538 (UC); N end of Bachelor Valley, S of Hells Peak, 645 (SFSU); south of Rodman Slough County Park, north of Robin Hill, 10310; Wilkinson Rd S of Kelseyville, 29 Mar 2012, K. Kellman 6810 (CAS). Typically this ephemeral moss with its tiny bulbiform shoots is only found in late winter and early spring. [= *Acaulon muticum* var. *rufescens*].

Aloina ambigua (Bruch & Schimper) Limpricht (Pottiaceae). Rare. On sunny, bare, disturbed calcareous soil. Hwy 20 at jct of New Long Valley Rd, 7299; base of Chalk Mtn., North Fork Cache Creek, 7300; Hwy 20, 10.3 mi E of Hwy 53 jct, 7456. This is recognized by its mucous, infolded leaf margins, which cover an area of dense adaxial filaments.

Alsia californica (Hooker & Arnott) Sullivant (Leptodontaceae). Rare. On shaded bases of oak and maple. Hidden Valley along Gallagher Creek N of Middletown, 5195; Hwy 175, 1.5 mi S of Whispering Pines, 7265; Boggs Mtn. State Forest, headwaters of Houghton Creek, 9966. This common coastal moss has apparently made incursions only in the southwestern portion of the county.

Amblystegium juratzkanum Schimper (Amblystegiaceae). Rare. In shaded seepage area. W slope of Goat Mtn. near Wyman Creek, MNF, 7541; Timber Lake, Snow Mtn. Wilderness, MNF, 8442. [= *A. serpens* (Hedwig) Bruch & Schimper var. *juratzkanum* (Schimper) Renaud & Cardot]

Amblystegium serpens (Hedwig) Bruch & Schimper. (Amblystegiaceae). Occasional. In shaded seepage areas and along streams. N end of Bachelor Valley S of Hells Peak, 520 (SFSU); Hartman Creek, Hidden Valley, 5192; Snow Mtn. Wilderness, tributary to Stony Creek, MNF, 5346b; City of Clearlake, a garden weed, 8750.

Amblystegium varium (Hedwig) Lindberg (Amblystegiaceae). Rare. On moist rock and soil on edge of streams and in large springy areas. Big Spring W of Potato Hill and Snow Mtn. Wilderness, MNF, 9884; Twin Springs along Forest Rd M3, tributary to Skeleton Creek, 9907. [= *Hygroamblystegium varium* (Hedwig) Mönkemeyer]

Amphidium californicum (Hampe ex Müller Hal.) Brotherus (Rhabdoweisiaceae). Common. Under rock overhangs and cliff crannies. Head of Grizzly Canyon between Elk Mtn. and Horse Mtn., MNF, 7682; Anderson Creek along Socrates Mine Rd, 5201; Hells Peak, 549 (SFSU); Stony Creek, Snow Mtn. Wilderness, MNF, 7610. This moss forms soft, deep cushions. When dry, the leaves are very crisped. Capsules are rare but when present are goblet-shaped with eight ribs and lack a peristome.

Amphidium lapponicum (Hedwig) Schimper (Rhabdoweisiaceae). Rare. On shaded, vertical rock faces at higher elevations. S slopes of Sheetiron Mtn., W of Low Gap, MNF, Shevock 15867 (CAS); High Rock, Forest Rd M6 at Eel River Crossing, MNF, 8109; Rock outcrop, headwaters of Cold Creek, two mi N of Crockett Peak, 9885. This species has less linear, entire leaves and being autoicous, fruits more frequently.

Anacolia baueri (Hampe) Paris (Bartramiaceae). Occasional. On soil in open places at low elevations. Near Hells Peak, 299 (SFSU); North Cow Mtn. BLM Recreation Area, 6959; Old Long Valley Rd near Spring Valley, 7367; Morgan Valley near Rieff Rd, 7054.

Anacolia menziesii (Turner) Paris (Bartramiaceae). Common. Mostly on N facing boulders and cliffs. Hells Peak near waterfall, 6873; E slope of Cobb Mtn. 7121; Clear Lake State Park, 6828; Mt. Konocti, near summit, 7880. This species often grows in deep tufts with rhizoids forming a dense, rusty tomentum on the lower stems. The capsules are globose and wrinkled when dry.

Andreaea heinemannii Hampe & Müller Hal. (Andreaeaceae). Rare. On sunny or shaded volcanic rock. Boggs Mtn. State Forest, on dacite, 7113 (det. by B. Murray); Mt. Konocti, summit of Wright Peak, on dacite, 7858; E slope of Cobb Mtn., on rhyolite, 7114 (det. by B. Murray); Along Eel River at N base of Pine Mtn., MNF, 10179. This plant can be recognized by its narrow, subulate leaves with a weak costa.

Andreaea rothii F. Weber & D. Mohr (Andreaeaceae). Rare. On partly shaded dacite. E slope of Cobb Mtn., 7115 (det. by B. Murray). This is distinguished from the more common *A. heinemannii* by its broader, somewhat secund leaves and more differentiated costa.

Antitrichia californica Sullivant ex Lesquereux (Leucodontaceae). Common. On hardwood tree trunks and shaded boulders. Hells Peak, 6871; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 6894; Blue Lakes, old county rd, 5011; Mt. Konocti, summit, 7870. This is the most dominant epiphyte on oaks in the county.

Archidium sp. [Archidiaceae]. On moist volcanic soil and sandy soil of lake deposits in sun. Hidden Valley at end of Conestoga Road, 9994; Robin Hill south of Rodman Slough County Park, 10328, 10338, 10339; meadow northwest of Boggs Lake, 10351. The first report of the genus *Archidium* in California (Kellman 3531, CAS) is from north-central Santa Cruz County, identified as *A. alternifolium* (Kellman 2003). The plants from Lake County cited above appear to the author to be identical to *Kellman 3531* (CAS). All of these Californian specimens do not agree well with any species treated in the worldwide monograph of *Archidium* (Snider 1975), as well as the treatments for the genus in Australia (Stone 2012) and North America (Spence 2007). The author concurs with W.R. Buck (pers. comm. 2015), that these specimens may represent an undescribed species.

Atrichum selwynii Austin (Polytrichaceae). Occasional. On shaded soil and soil over rock, especially eroded creek banks and roadcuts. Blue Lakes, old county rd, 5004; N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7428; Grizzly Canyon N of Elk Mtn., MNF, 7692; Alder Creek, Cobb Mtn., 7090. This may be recognized by the presence of low lamellae on the midrib, coarsely serrate leaf margins, and sporophytes with smooth calyptrae.

Aulacomnium androgynum (Hedwig) Schwägrichen (Aulacomniaceae). Occasional. On shaded rotten logs, forest floor and tree bases; rarely present outside coniferous forest. Forest Rd M6 at Provence Cabin, MNF, 5058h; one mi W of Soda Creek Ranger Sta., MNF, 5090; Crockett Camp, Snow Mtn. Wilderness, MNF, 5141; W slope Goat Mtn. near Wyman Creek, MNF, 7562. This is easily recognized by the leafy shoots that are topped with a stalk bearing terminal clusters of gemmae. The uncommon capsules are sulcate when dry.

Aulacomnium palustre (Hedwig) Schwägrichen (Aulacomniaceae). Rare. In wet meadows at higher elevations. N cirque of Hull Mtn., MNF, 7228, 7621; head of Mill Creek, Mt. Sanhedrin, MNF, 7636; wet meadows N of Forest Rd M3 and Crockett Peak,

9903. This wetland species is far more common in the Sierra Nevada than the Coast Ranges.

Barbula convoluta Hedwig (Pottiaceae). Infrequent. Soda Bay Rd, Mt. Konocti, 7355; Hidden Valley N of Middletown, 7373; Lakeport, Lake County Museum grounds, 7662; Clear Lake State Park, 7035. This species forms bright yellow-green cushions, the leaves have a mostly non-excurrent costa, and the sporophyte has a yellow seta.

Barbula unguiculata Hedwig (Pottiaceae). Rare. Library Park, Lakeport, 7663; Little Borax Lake, base of Mt. Konocti, 7852; W of Lakeport near Hartley Rd, on garden soil, 8784 (coll. E. Dearing). In contrast to *B. convoluta*, this species has a reddish-brown seta and excurrent costa.

Bartramia aprica Müller Hal. (Bartramiaceae). Infrequent. On shallow soil over rock, in open areas such as grasslands and oak woodland. N end of Bachelor Valley S of Hells Peak, 6862 (ver. by D. Griffin III); Manning Creek, four mi W of Lakeport on Hwy 175, 8509; Forest Rd M12 to Bartlett Springs above Hwy 20, 9359; Hidden Valley, end of Conestoga Rd, 16 Apr 2012, E. Dearing s.n. (CAS). This moss forms dense tufts of stiff, straight, somewhat glaucous shoots. Damayanti et al. (2012) demonstrated that *Bartramia stricta* Bridel consists of two morphologically and molecularly differentiated species, one from southern South America and the other from the Mediterranean and western North America. Subsequently, Müller (2014) determined that *Bartramia aprica* is the correct name for the Mediterranean and western North American plants.

Bestia longipes (Sullivant & Lesquereux) Brotherus (Lembophyllaceae). Rare. On shaded boulders and exposed tree roots. Clear Lake State Park along Kelsey Creek Slough, 6844, 7157; Anderson Springs, 2529 (SFSU); Robert Louis Stevenson State Park, Troutdale Creek, 8427. The Lake County occurrences represent the northernmost outposts for this Californian endemic (Shevock et al. 2008). Luxuriant colonies can be seen at Clear Lake State Park.

Brachytheciastrum collinum (Schleicher ex Müller Hal.) Ignatov & Huttunen (Brachytheciaceae). Rare. In shaded rock crevices. Summit Springs Trail, Snow Mtn. Wilderness, MNF, 7464; N cirque, Snow Mtn. Wilderness, MNF, 9164. This species is common in the Great Basin and High Sierra Nevada; the Snow Mtn. populations can be regarded as western outliers.

Brachytheciastrum velutinum (Hedwig) Ignatov & Huttunen (Brachytheciaceae). Occasional. On shaded tree bases, rotten logs, soil, and over duff. Boggs Mtn. State Forest, 5016; Corbin Creek S of Pine Kop, MNF, 5058g; E slope Cobb Mtn., 7086; Garrett Mtn. above Bucknell Creek, MNF, 7424. This fine-textured, more or less glossy moss prefers coniferous forests.

Brachythecium acutum (Mitten) Sullivant (Brachytheciaceae). Infrequent. Growing on soil, always as a lawn weed. Lakeport, Library Park, 7665; Lakeport at Lake County Fairgrounds, 9589 (det. by M. Ignatov); Lakeport at Anchorage Inn Motel, 9542a (det. by M. Ignatov); Along Hwy 20 at Blue Lakes

Lodge Resort, 9586a (det. by M. Ignatov). The first report of this *Brachythecium* Schimper from California was apparently from Ignatov et al. (2008), from a lawn in Los Angeles County. They suspected it was introduced and gave its natural habitat as "wet soil and peat in fens and swamps".

Brachythecium albicans (Hedwig) Bruch & Schimper (Brachytheciaceae). Common. On shaded soil, litter, and boulders. Crockett Camp, Snow Mtn. Wilderness, MNF, 5139; Blue Slides Lake, MNF, 5268 (ver. by D. Norris); South Cow Mtn. BCM Recreation Area, 7027; Clear Lake State Park, 6850.

Brachythecium asperillum (Müller Hal.) Sullivant (Brachytheciaceae). Infrequent. On moist soil in shade. Canyon of Bucknell Creek between Garrett Mtn. and Pine Mtn., MNF, 8895; Forest Rd M8 at MNF boundary, 7523; Grizzly Canyon N of Elk Mtn., MNF, 7951; Hwy 175 near Salinas, 5215c. This is easily confused with the more common *Brachythecium frigidum* (Müller Hal.) Beschereille, but grows in somewhat dryer habitats.

Brachythecium bolanderi (Lesquereux) A. Jaeger (Brachytheciaceae). Occasional. On shaded soil banks, often mixed with other mosses. Slope W of Hells Peak, 634 (SFSU); Scotts Valley Rd S of Blue Lakes, 8729; Dashiells Creek W of Lake Pillsbury, MNF, 7260 (ver. by M. Ignatov); South Cow Mtn. BLM Recreation Area, Rd to Red Mtn. Camp, 8162b. This species, not found with sporophytes in the county, is rather nondescript and resembles *Brachytheciastrum velutinum*, but has broader leaves and is less glossy.

Brachythecium frigidum (Müller Hal.) Beschereille (Brachytheciaceae). Common. In springs, seeps, wet montane meadows and along streams. Boggs Mtn. State Forest, 7104; Streeter Ridge, Horse Mtn., MNF, 7454; headwaters of Bear Creek, Snow Mtn. Wilderness, MNF, 7486; Forest Rd M8 at MNF boundary, 7524. This extremely variable moss grows in wet places of almost every description.

Brachythecium rivulare Bruch & Schimper (Brachytheciaceae). Rare. On rock in splash zone of cascading stream. Headwaters of Bear Creek, Snow Mtn. Wilderness, MNF, 7510 (ver. by M. Ignatov). This can be distinguished from the extremely common *B. frigidum* by its more aquatic habitat, its leaves having less serrulate margins, more shortly tapering apices, and larger alar areas.

Brachythecium rutabulum (Hedwig) Bruch & Schimper (Brachytheciaceae). Rare. On moist soil among grasses and sedges on edge of meadow, sometimes partially submerged. Cold Spring, Walker Ridge, 9870; Big Spring W of Potato Hill and Snow Mtn. Wilderness, MNF, 9880 (ver. by J. Janssens).

Bruchia flexuosa (Schwägrichen) Müller Hal. (Bruchiaceae). Rare. On moist shaded soil along drainage. County Park W of Middletown, 9400; same locality, 9816 & 9849. This ephemeral species may be more common in California than the few records indicate. It has been reported from Mendocino County (Rushing 1986) and Santa Cruz County (Kellman 2003).

Bryoerythrophyllum columbianum (F.J.Hermann & E. Lawton) R.H. Zander (Pottiaceae). Rare. On sunny

soil over rock in grassy woodland, four mi W of Lakeport on Hwy 175, 6999 (ver. by R. Zander); Big Canyon Rd near Ettawa Springs, 9388. This small inconspicuous moss may be more common than presently documented. It is also known from single collections in several counties extending to central California.

Bryoerythrophyllum ferruginascens (Stirton) Giacomini (Pottiaceae). Rare. On moist, bare rocky soil, on edge of seasonal stream. E tributary to S fork of Scotts Creek, 0.5 mi S of main stem confluence, 10177. This specimen, although somewhat reduced in size, has multicellular rhizoidal gemmae, a definitive character for certain identification. They are orange and sometimes irregularly branched. The leaves are slightly spreading from an upright base and microscopically the ventral surface of the costa is flattened in cross-section. The first report of this species (*T. Sagar 518*) from California was from the Santa Monica Mts. in Ventura County (Sagar and Wilson 2007). I have examined this specimen, which was determined by R.H. Zander and it compares favorably with the Lake County specimen, although gemmae were not found. The two California localities have filled a gap in its range between western Canada and México (Zander 2007).

Bryolawtonia vancouveriensis (Kindberg) D.H. Norris & Enroth (Neckeraceae). Rare. On shaded rock overhangs and in crevices near running water. Grizzly Canyon N of Elk Mtn., MNF, 7685; same area 1/4 mi downstream, 7950; Canyon of Bucknell Creek between Garrett Mtn. and Pine Mtn., MNF, 8899. In California, this species is much more common in the fog belt along the immediate coast.

Bryum argenteum Hedwig (Bryaceae). Common. On sunny, dry soil or rock. Clear Lake State Park, 6848; Manning Creek, Hwy 175, four mi W of Lakeport, 7004; Central Park, Middletown, 7845; forest Rd M12 from Nice to Bartlett Mtn., MNF, 8130.

Bryum calobryoides J.R. Spence (Bryaceae). Rare. On moist soil over rock near stream. Bartlett Mtn. along Forest Rd M12 below Pinnacle Rock, MNF, *E. Dearing s.n.* (det. by J. Spence).

Bryum chryseum Mitten (Bryaceae). Rare. On dry volcanic soil in oak woodland, mixed with other mosses. Jerusalem Valley, 0.1 mi N of Gunther Creek crossing, 10267. Toren and Heise (2009) first reported this species from North America north of México and subsequently it has been collected in several California counties. The very small plants with their shiny golden color and reflexed leaf apices make this species unmistakable. The previous known range was México to Chile.

****Bryum veronense*** De Notaris (Bryaceae). Rare. On sunny, old concrete wall. Jerusalem Grade Rd at Soda Creek crossing, 9986 (ver. by J. Spence). This species resembling a green version of *Bryum argenteum* was found growing with the latter. Spence (2007) reported the first North American record from Colorado and it has subsequently been collected in Ontario, Quebec, and Vermont (Spence 2007).

Bucklandiella affinis (Schleicher ex F. Weber & D. Mohr) Bednarek-Ochyra & Ochyra (Grimmiaceae).

Rare. On shaded rock, sometimes near water. E slope of Cobb Mtn. above Whispering Pines, 7134 (ver. by Bednarek-Ochyra); N slope of Kneecap Ridge, tributary of Sheep Creek, MNF, 8835 (ver. by Bednarek-Ochyra); Boggs Mtn. State Forest, 8923. This is similar to *Bucklandiella heterosticha* (Hedwig) Bednarek-Ochyra & Ochyra but has a more delicate texture and darker green color.

Bucklandiella heterosticha (Hedwig) Bednarek-Ochyra & Ochyra (Grimmiaceae). Occasional. On sunny or shaded boulders and cliff faces. Forest Rd M1 at Eel River below Lake Pillsbury, MNF, 7267; Grizzly Canyon N of Elk Mtn., MNF, 7962; Cobb Mtn., E slope, 7134; High Rock E of Hull Mtn., MNF, 8107.

Bucklandiella obesa (Frisvoll) Bednarek-Ochyra & Ochyra (Grimmiaceae). Rare. On shaded rock near stream. N slope of Kneecap Ridge, tributary of Sheep Creek, 8838 (ver. by Bednarek-Ochyra). This species typically grows in more shaded habitats than the other species of the genus and the seta is relatively shorter.

Campylopus introflexus (Hedwig) Bridel (Dicranaceae). Rare. On sunny, acidic soil on edge of vernal pool. S shore of Clear Lake at Sulphur Bank Mine, 8027. This introduced moss can be recognized by its lanceolate-subulate leaves and hyaline awns that are reflexed at 90° when dry. Carter (2014) reported this inland locality and gave an account of its spread in western North America.

Ceratodon purpureus (Hedwig) Bridel (Ditrichaceae). Common. In open areas, mostly on disturbed soil. The Slides W of Lake Pillsbury, MNF, 5042a; Sulphur Bank Mine, Clear Lake, 7277; Bartlett Springs Rd near Reister Bridge, MNF, 8139; N end of Bachelor Valley S of Hells Peak, 329 (SFSU).

Ceratodon stenocarpus Bruch & Schimper (Ditrichaceae). Infrequent. On soil or soil over rock in crevices. Near summit of Mt. Hannah, 9402a; Goat Rock NW of Middletown and SW of Harbin Springs, 10131; Mt. Sanhedrin, margin of wet meadow above headwaters of Mill Creek, 10225.

Claopodium bolanderi Best (Leskeaceae). Infrequent. Found only in mixed conifer forest on shaded rocks and tree bases. Ericson Ridge, Mt. Sanhedrin, MNF, 5107; S of Summit Lake, MNF, 7185; Stony Creek, Snow Mtn. Wilderness, MNF, 7599; N slope of Kneecap Ridge, tributary to Sheep Creek, MNF, 8832.

Claopodium whippleanum (Sullivant) Renaud & Cardot (Leskeaceae). Common. On shaded, bare soil banks, sometimes in rock crevices. Pogie Point Campground, Lake Pillsbury, MNF, 5082; Wyman Creek S of Goat Mtn., MNF, 7559; along Pitney Ridge to Youngs Peak, MNF, 8068; Clear Lake State Park, 7161.

Codriophorus acicularis (Hedwig) Palisot de Beauvois (Grimmiaceae). Infrequent. On rock along streams in sun or open shade. Rattlesnake Creek E of Hull Mtn., MNF, 8100; Forest Rd M1 at Eel River Bridge below Lake Pillsbury, MNF, 7443; Crabtree Hot Springs, MNF, 5239; Bucknell Creek between Garrett Mtn. and Pine Mtn., 8892. This is one of a group of rheophytes, or species of seasonal streambeds. It is not as common

as *Schistidium rivulare* (Bridel) Podpěra or *Scleropodium obtusifolium* (Mitten) Kindberg.

Codriophorus depressus (Lesquereux) Bednarek-Ochyra & Ochyra (Grimmiaceae). Rare. Semiaquatic, on volcanic rock in intermittent stream. Boggs Mtn. State Forest, headwaters of Houghton Creek, 9842. The local specimen was first thought to be *Bucklandiella pacifica* (Ireland & J.R. Spence) Bednarek-Ochyra & Ochyra. Indeed, this plant has been confused in the past with that species. Even though the Lake County specimen was growing at a lower elevation than usual, it was separable from *Bucklandiella pacifica* in having larger plants, with larger, broader and less keeled leaves, and with more divided, less papillose peristome teeth.

Codriophorus varius (Mitten) Bednarek-Ochyra & Ochyra (Grimmiaceae). Occasional. On sunny or shaded rock or soil over rock. County rd one mi W of Soda Creek near Lake Pillsbury, MNF, 5047e; along Soda Bay Rd, base of Mt. Konocti, 7380; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 6923; Boggs Lake, 5214; Adams, 25 Aug 1922, T.C. Frye s.n. (WTU; Bednarek-Ochyra 2006). This relatively coarse species of *Codriophorus* Palisot de Beauvois can grow along streams and trap sediment and sometimes has nearly muticous leaves.

Conardia compacta (Hooker) H. Robinson (Campyliaceae). Rare. On moist to wet soil and rock. Along small stream, Rd to Harbin Springs S of Boggs Mtn. State Forest, 7281; Cold Spring east and upslope from Indian Valley Reservoir, 9831; Jerusalem Valley, confluence of Gunther and Soda Creeks, 10277. This small pleurocarp resembles *Amblystegium serpens* but has a stronger costa, longer leaf cells, and teeth at the basal leaf margins.

Coscinodon calyptratus (Drummond) C.E.O. Jensen (Grimmiaceae). Rare. Tributary to Bear Creek N of Cedar Camp, Snow Mtn. Wilderness, MNF, 9441 (det. by R. Hastings). This locality could be a western outlier for this species in California. It is more characteristic of dry interior areas of the Great Basin and Rocky Mountains.

Cratoneuron filicinum (Hedwig) Spruce (Amblystegiaceae). Rare. In wet meadows, dripping springs and splash zones of cold streams, Snow Mtn. Wilderness and vicinity, MNF, only. Wet meadow below west peak, 7480; headwaters of Bear Creek, 7490; seep near Bowery Flat just N of wilderness boundary, 7585; Upper Nye Camp, 7586; wet meadows N of Forest Rd M3 and Crockett Peak; Cold Spring, Walker Ridge, E and upslope from Indian Valley Reservoir, 9833, 9835, 9869, 10117. The plants cited from Walker Ridge deviate greatly from specimens seen by the author across California. They are deep green, rigid, with few branches, and have narrow leaves with extremely strong, excurrent costae. In North America, these plants were recognized as *Amblystegium tenax* (Hedwig) C.E. O. Jensen var. *spinifolium* (Schimper) H.A. Crum & L. E. Anderson. Interestingly, this plant has not been previously reported from California (Norris and Shevock 2004). Molecular studies show these plants most likely represent habitat modifications and should not be recognized taxonomically (Hedenäs 2012). Molecular studies were performed on 10117 by Hedenäs

in 2014 revealing ITS markers having a relationship with Asiatic specimens and chloroplast markers placing 10117 among American and Asiatic specimens (L. Hedenäs, personal communication).

Crossidium squamiferum (Viviani) Juratzka (Pottiaceae). Rare. On dry, exposed calcareous rock and soil over rock. Hells Peak, 6864; Knoxville BLM Recreation Area near Round Mtn., 7065; Chalk Mtn., North Fork of Cache Creek, 7314; BLM Cache Creek Management Area, Redbud Trail, Kellman 6835. Delgadillo (1975) mapped the distribution of this species only from southern California, but Norris and Shevock (2004) included records from two northern California counties.

Crumia latifolia (Kindberg) W.B. Schofield (Pottiaceae). Occasional. On calcareous soil or rock along streams and in seepage areas. Hells Peak below waterfall, 308 (SFSU); near Harbin Springs, 7282a; Spring Valley along Wolf Creek, 7735; Carter Glade above Clover Creek, MNF, 7994. Sporophytes of *Crumia* are quite rare. The peristome teeth are divided in two forks, which are jointed and irregularly anastomosing (Schofield 1966).

Dendroalsia abietina (Hooker) E. Britton ex Brotherus (Cryphaeaceae). Common. On hardwood tree trunks and shaded boulders. Dashiells, Mt. Sanhedrin, MNF, *A. Eastwood s.n.* (CAS); Sawmill Flat, Bartlett Mtn., MNF, 5230; North Cow Mtn. BLM Recreation Area, headwaters of Scotts Creek, 6982; Clear Lake State Park, along Kelsey Creek slough, 6852. The dark green, feather-like plants, which coil downward when dry, are unmistakable. It is especially common on the bark of oaks.

Dichodontium pellucidum (Hedwig) Schimper (Dicranaceae). Occasional. On seepy rock faces and along streams and waterfalls. Near Blue Slides Lake, MNF, 5270; South Cow Mtn. BLM Recreation Area, Panther Creek, 6877; N cirque, Hull Mtn., MNF, 7617; Snow Mtn. Wilderness, Stony Creek, MNF, 7592.

Dicranella heteromalla (Hedwig) Schimper (Dicranaceae). Rare. On shaded, moist bare soil or in seepy rock crevices. Just S of Lake Pillsbury along Forest Rd M1, MNF, 7175; N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7414a (det. by W. Schofield); Grizzly Canyon N of Elk Mtn., MNF, 7954.

Dicranella howei Renaud & Cardot (Dicranaceae). Infrequent. On wet clay soil around small streams and seeps. Forest Rd M8 W of Rd M1, MNF, 7173; Log Ridge along Forest Rd M1, MNF, 7673; Buck Island along Cache Creek, 7539; Rodman Slough E of Westlake School, 8532. This species has a wide costa occupying 1/3 of the leaf base and is not sharply differentiated from the lamina (Crundwell and Nyholm 1977). In addition, the author has observed it growing in wetter habitats than those observed for *Dicranella varia* (Hedwig) Schimper.

Dicranella rufescens (Withering) Schimper (Dicranaceae). Rare. On moist, bare garden soil. Library Park, Lakeport, 8430, 8514. (det. B. Allen).

Dicranella staphylina H. Whitehouse (Dicranaceae). Rare. On exposed, seasonally moist acidic soil, associated with cyanobacteria colonies. Sulphur Bank Mine, just S of main pit, 10287. The very small, translucent plants with wide leaf cells and the constant presence of orange-brown rhizoidal tubers with irregularly arranged and protuberant cells characterize this species. It has only been recently detected in California. Arts (1985) detailed more differences between this species and the related *D. rufescens* and *D. varia*.

Dicranella varia (Hedwig) Schimper (Dicranaceae). Common. On rather shaded bare soil, often with other mosses. Ericson Ridge, Mt. Sanhedrin, MNF 5085 (det. by W. Schofield); North Cow Mtn., BLM Recreation Area, Glen Eden Trail, 6991; Garrett Mtn., MNF, 7172; Siegler Mtn. near summit, 7892. This species has a sharply defined and narrow costa (Crundwell and Nyholm 1977).

Dicranoweisia cirrata (Hedwig) Lindberg (Seligeriaceae). Common. On sunny or shaded logs, often on decorticated manzanita, old fence posts, and bases of Douglas firs. E slope of Cobb Mtn., 7102; along Corbin Creek, MNF, 5058c; one mi W of Soda Creek near Lake Pillsbury, MNF, 5091; Western Mine Rd N of Mt. St. Helena, 5220. Tufts of this moss resemble pincushions.

Dicranum fuscescens Turner (Dicranaceae). Infrequent. On shaded decayed logs and bases of Douglas fir. Grizzly Canyon N of Elk Mtn., MNF, 7699; Garrett Mtn. S of Bucknell Creek, MNF, 7416; two mi SW of Lake Pillsbury, S of forest Rd M8, MNF, 7434; county Rd W of Soda Creek, MNF, 577 (SFSU).

Dicranum howellii Renaud & Cardot (Dicranaceae). Infrequent. On shaded, decayed logs and steep banks mixed with other mosses. E slope of Garrett Mtn., MNF, 7171 (ver. by D. Norris); above Forest Rd M1 near M8 jct, MNF, 7431; tributary to Willow Creek E of Log Ridge, MNF, 7455a; one mi W of Soda Creek, MNF, 7358.

Didymodon australasiae (Hooker & Greville) R.H. Zander (Pottiaceae). Rare. On exposed soil over rock. Chalk Mtn., North fork of Cache Creek, 7310; forest Rd M12 from Nice to Bartlett Mtn., 8122. This species is common in the desert areas of California but is rare in the northern part of the state.

Didymodon bistratosus Hébrard & R.B. Pierrot (Pottiaceae). Rare. On rock and soil over rock. Soda Bay Rd overlooking Clear Lake opposite Ferndale Resort, 9587 (ver. R. Zander). Originally described from Spain, this species was first reported from California from Los Angeles County (Zander et al. 2005). The Lake County site is currently the northernmost in the state.

Didymodon brachyphyllus (Sullivan) R.H. Zander (Pottiaceae). Infrequent. On moist to dry bare soil along streams and roadcuts. Hwy 20, 10 mi E of Hwy 53 jct, 7317 (ver. by R. Zander); Hwy 20 and New Long Valley Rd, 7313; Loch Lomond Rd W of Hobergs Airport, 7895 (ver. by R. Zander). The

specimen from Loch Lomond Rd was illustrated in Zander and Ochrya (2001).

Didymodon californicus J.A. Jiménez, D.R. Toren & Shevock (Pottiaceae). Rare. Rheophytic, on rocks at higher elevations. Ridge E of Crockett Peak and S of Upper Nye Meadow, MNF, Snow Mtn. Wilderness, 9926. This recently described species (Jiménez et al. 2014) has a combination of characters not found in the widespread *Didymodon vinealis* (Bridel) R.H. Zander, such as plane leaf margins and the absence of costal stereids above midleaf.

Didymodon eckeliae Zander (Pottiaceae). Infrequent. On rock and bases of oaks. Middletown, Central Park, 7363 (ver. R. Zander); Twin Pines Casino S of Middletown, 9514; Clear Lake State Park, 9542d; Big Squaw Valley E of Lake Pillsbury, MNF, 9584. This recently described moss is probably more common in western North America than currently documented. It can be told from close relatives in the *D. vinealis* group by its scalloped and bistratose leaf margins (Zander 2001).

Didymodon fallax (Hedwig) Zander (Pottiaceae). Rare. On moist soil in diffuse light. S shore of Clear Lake near Sulphur Bank Mine, 0.2 mi S of Sulphur Bank Rd, 10264. The elongate cells covering the upper surface of the costa distinguish this plant from members of the *Didymodon vinealis* complex.

Didymodon insulanus (De Notaris) M.O. Hill (Pottiaceae). Occasional. On moist soil over rock, often along fissure lines of boulders in the flood zone of streams. North Cow Mtn. BLM land, Eight Mile Valley, 6893 (det. by D. Norris); Castle Rock Springs Rd S of Cobb Mtn., 5017; Carter Glade above Clover Valley, 7992.

Didymodon nicholsonii Culmann (Pottiaceae). Occasional. On rock and tree roots in the flood zone of streams. Eel River below Scott Dam, Lake Pillsbury, MNF, 7138a; W of Low Gap, S of Sheetiron Mtn., 5169; shore of Clear Lake S of Lucerne, 7712 (ver. by R. Zander); Hells Half Acre along Putah Creek 8485.

Didymodon norrisii R.H. Zander (Pottiaceae). Occasional. On rock or soil over rock in seasonally wet areas, small streams, drainage ways on outcrops and cliffs. Hells Peak, 636 (SFSU, BUF); North Cow Mtn. BLM Recreation Area at CDF water tank, 6940 (BUF); Manning Creek, four mi W of Lakeport on Hwy 175, 7402 (BUF) (ver. by R. Zander); Carter Glade above Clover Creek, MNF, 7998. When this distinctive species was described, sporophytes were unknown (Zander 1999). Subsequently, sporophytes were discovered and are peristomate but rudimentary.

Didymodon tophaceus (Bridel) Lisa (Pottiaceae). Common. On wet calcareous soil and rock in streams and seepage areas; also in wet serpentine areas. Trail to Bloody Rock NE of Lake Pillsbury, MNF, 5047f; Carter Glade above Clover Creek, MNF, 7995; Hwy 175, one mi E of Mendocino County line, 7451; Knoxville BLM Recreation Area near Round Mtn., 7071. In addition to the wet habitat, this species can be recognized by the tongue-shaped leaves and short-cylindric capsules.

Didymodon vinealis (Bridel) R.H. Zander (Pottiaceae). Common. On dry to wet soil and rock, also tree bases.

Morgan Valley Rd, 7051; N shore of Clear Lake, Rodman Slough, 7170 (BUF) (ver. by R. Zander); Crockett Peak, Snow Mtn. Wilderness along Stony Creek, MNF, 7614b (BUF); along forest Rd M1 S of Lake Pillsbury, MNF, 7653. This species is morphologically extremely variable.

Didymodon umbrosus (Müller Hal.) R.H. Zander (Pottiaceae). Rare. On moist soil of planter bed, Library Park, Lakeport, 9050. The occurrence of this plant is consistent with the observations of Eckel (1986) that it is associated with human activities.

Ditrichum ambiguum Best (Ditrichaceae). Occasional. On shaded bare soil and rock crevices. County Rd to Lake Pillsbury W of Soda Creek, MNF, 5047; 1.5 mi S of Whispering Pines on Hwy 175, 7266; Old Blue Lakes Rd, 5002; Deer Valley Campground, MNF, 8009.

Ditrichum schimperii (Lesquereux) Kuntze (Ditrichaceae). Infrequent. On sunny or shaded bare, acidic soil. Hot spring at Anderson Springs, 7254; Sulphur Bank Mine, Clear Lake, 7276; South Cow Mtn. BLM Recreation Area E of Eight Mile Valley, 7345; Forest Rd M1 near Packsaddle Creek, MNF, 7671.

Drepanocladus aduncus (Hedwig) Warnstorf (Campyliaceae). Occasional. In shallow lakes, wet meadows, and large vernal pools. Boggs Lake at W base of Mt. Hannah, 5215; Snow Mtn. Wilderness at Cedar Camp, MNF, 7485; Vernal pool between Copper Butte and Eel River, MNF, 5162 (ver. J. Janssens); Meadows about Clear Lake, *V. Rattan s.n.* (UC).

Drepanocladus polycarpon (Blandow ex Voit) Warnstorf (Campyliaceae). Occasional. In wet montane meadows, sometimes a garden weed. Along Forest Rd M3, N of Crockett Peak, MNF, 5147; N cirque of Hull Mtn., MNF, 7618 (det. J. Janssens as *D. aduncus* var. *polycarpon*); City of Clearlake, a garden weed, 8752; Snow Mtn. Wilderness at Cedar Camp, MNF, 7484.

Drepanocladus polygamus (Schimper) Hedenäs (Campyliaceae). Rare. On wet margins of shallow ponds. Tule Lake, Mt. Sanhedrin, MNF, 7201 (det. by J. Janssens); Patty's Petals Nursery, Kelseyville, 7613 (coll. E. Dearing) (det. by L. Hedenäs); Timber Lake, Snow Mtn. Wilderness, MNF, 8437.

Drepanocladus sordidus (Müller Hal.) Hedenäs (Campyliaceae). Rare. In drainage of wet meadow surrounding calcareous warm spring. Cobb Valley N of town of Cobb, W base of Boggs Mtn. and E of Bottlerock Rd, 9731 (ver. by L. Hedenäs). Although *D. sendtneri* (Lawton 1971) has been reported from North America by various authors, Hedenäs (1998) considered all these reports to be *D. sordidus*, which has a different ratio between leaf lamina cell width and leaf length as well as its preference for less mineral-rich wetland habitats.

Encalypta ciliata Hedwig (Encalyptaceae). Infrequent. On shaded shallow soil over rock, often with other mosses. Horse Creek E of Hull Mtn., MNF, 876 (SFSU); Hells Peak, 544 (SFSU); Alder Creek, Cobb Mtn., 7099 (ver. by D. Horton); Forest Rd M1, Eel River crossing below Lake Pillsbury, MNF, 9479. This *Encalypta* is recognized by its fringed calyptra, smooth capsules, and mucronate to cuspidate leaf apices.

Encalypta rhytocarpha Schwägrichen (Encalyptaceae). Rare. On exposed metavolcanic rock. Forest Rd M1, Eel River crossing below Lake Pillsbury, MNF, 9478a. This species differs from *E. ciliata* and *E. vulgaris* in its hyaline awn and ribbed capsules.

Encalypta vulgaris Hedwig (Encalyptaceae). Infrequent. On dry soil over rock in open shade, often on old road banks. E of Complexion Spring, 7297; Chalk Mtn., North fork of Cache Creek, 7311 (det. by D. Horton); Manning Creek, four mi W of Lakeport on Hwy 175, 7338 (det. by D. Horton); Bartlett Mtn., E of Nice, MNF, 8128. This species is distinguished from *E. ciliata* and *E. rhytocarpha* by the combination of an unfripped calyptra, muticous leaves, and smooth capsules.

Entosthodon californicus (Sullivant & Lesquereux) H.A. Crum & L.E. Anderson (Funariaceae). Rare. On bare soil in grassy areas. N end of Bachelor Valley S of Hells Peak, 656 (SFSU); four mi W of Lakeport on Hwy 175, 7001; Jerusalem Valley, vicinity of Gunther Creek, 10268, 10271, 10274.

Ephemerum serratum (Hedwig) Hampe (Ephemeraeae). Rare. On sunny, moist bare soil. Hwy 53 one mi S of Hwy 20, Norris 47709 (UC); east base of Hells Peak, 1476; just S of Lakeport at end of Linda Lane, 9055; High Valley N of Clearlake Oaks, 8956. This minute moss has shoots only about two mm tall, and leaves surround the mature orange capsules. It is likely to be found only during the spring months.

Epipterygium tozeri (Greville) Lindberg (Mniaceae). Common. On moist, shaded bare soil, the stems often projecting from steep streambanks. Ericson Ridge, Mt. Sanhedrin, MNF, 5086; South Cow Mtn. BLM Recreation Area, Rocky Lake, 6901; North Cow Mtn. BLM Recreation Area near CDF Water tank, 6973; base of Hells Peak, 521 (SFSU). This moss is distinguished by pale green plants with pinkish tinges somewhat flattened in one plane with leaves in two distinct sizes.

Eucladium verticillatum (Withering) Bruch & Schimper (Pottiaceae). Occasional. On soil or rock in calcareous springs and small streams, usually shaded. Hells Peak, 642 (SFSU); Anderson Creek below Socrates Mine Rd, 5205 (coll. by E. Dearing); Old Long Valley Rd, 7365; Hwy 20, four mi N of Glenhaven, 8063. This is less common than *Didymodon tophaceus* of the same habitats and the tufts have a paler, glaucous coloration. Microscopically, just above the leaf base, the margin has projecting teeth.

Eurhynchiastrum pulchellum (Hedwig) Ignatov & Huttunen (Brachytheciaceae). Rare. On shaded rock in stream canyon. Tributary to Stony Creek NW of Milk Ranch, Snow Mtn. Wilderness, MNF, 9450. In the field, this can be recognized by its distinctively curved and blunt-tipped branch leaves.

Fabronia pusilla Raddi (Fabroniaceae). Common. On hardwood tree trunks and rock overhangs and crevices. Lake Pillsbury, Oak Flat Campground, MNF, 5068; S slopes of Sheetiron Mtn., W of Low Gap, MNF, 5170; base of Mt. Konocti, Clark Drive, 7374 (det. by W. Buck); E slope of Cobb Mtn., 7135. This very small

pleurocarpous moss is distinctive by its ciliate-dentate leaves and cup-shaped capsules.

Fissidens bryoides Hedwig (Fissidentaceae). Rare. Submerged or in splash zones of small streams. Sweetwater Creek, Hidden Valley, 7075 (ver. by R. Pursell); Carter Glade, MNF, 7989.

Fissidens crispus Montagne (Fissidentaceae). Common. Mostly on moist, shaded soil banks. Bottlerock Rd near Cobb, 7576; Violet Spring, Log Ridge, MNF, 5284; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 6897; Clear Lake State Park, 7353. This species is widespread in the county but does not occur at the highest elevations.

Fissidens curvatus Hornschuch (Fissidentaceae). Infrequent. On bare soil in grassland areas. N end of Bachelor Valley S of Hells Peak, 2927 (SFSU); three mi S of Middletown on Hwy 29, 7842; Rodman Slough E of Westlake School, 8522; Sulphur Bank Mine, 0.2 mi S of Sulphur Bank Rd, 10286a. This small *Fissidens* Hedwig can be recognized by its narrow, tapering leaves.

Fissidens fontanus (Bachelot de la Pylaie) Steudel (Fissidentaceae). Infrequent. Aquatic, sometimes emergent due to fluctuating water levels, along lakeshores and slow streams. Clear Lake State Park, 6846; Blue Lakes near the Narrows, 523 (SFSU); County Rd 122 along Asbill Creek N of Middletown, 7734; S shore of Clear Lake at Corinthian Bay County Park, Norris 71780 (UC). It is especially abundant around the shores of Clear Lake.

Fissidens grandifrons Bridel (Fissidentaceae). Infrequent. Aquatic, in running water or in splash zones, especially around waterfalls. Snow Mtn. Wilderness, MNF, Lower Nye Camp, 5338; tributary to Stony Creek, Snow Mtn. Wilderness, MNF, 7612; Wyman Creek S of Goat Mtn., MNF, 7563; Snow Mtn. Wilderness, Copper Butte Creek, MNF, 8450. This robust aquatic species is very dark green and the stems and leaves are harsh to the touch.

Fissidens sublimatus Grout (Fissidentaceae). Common. On sunny soil or along intermittent waterfalls. Hidden Valley N of Middletown, 7373a (ver. by R. Pursell); three mi S of Middletown on Hwy 175, 7842a; High Valley N of Clearlake Oaks, 8964; Coyote Valley off Grange Rd N of Middletown, 9397 (det. by R. Pursell).

Fissidens ventricosus Lesquereux (Fissidentaceae). Rare. Aquatic, attached to rocks in small streams. Gunning Creek, Cobb Mtn., 7119; Grizzly Canyon N of Elk Mtn., MNF, 7683; Bucknell Creek between Garrett Mtn. and Pine Mtn., MNF, 8893. The aquatic habitat and the sporophyte with its short, stout seta aid in identifying this species in the field.

Fontinalis antipyretica Hedwig (Fontinalaceae). Occasional. In running or still water, all elevations. St. Helena Creek N of Middletown, 7302; Snow Mtn. Wilderness, pond at Cedar Camp, MNF, 7487; Copsey Creek E of Lower Lake, 7331 (det. by B. Allen); Highland Creek near Highland Springs, 7907. This is the most common species of *Fontinalis* Hedwig in the county.

Fontinalis chrysophylla Cardot (Fontinalaceae). Rare. In seasonal drainage of wet montane meadow. Upper Nye Camp near Snow Mtn. Wilderness trailhead, MNF, 5167 (det. by B. Allen). [= *F. howellii* Renaud & Cardot]

Fontinalis gigantea Sullivant (Fontinalaceae). Rare. In drainages of wet montane meadows and small streams. Crockett Camp, Snow Mtn. Wilderness, MNF, *Shevock 15821* (CAS); tributary to Stony Creek, Snow Mtn. Wilderness, MNF, 7590 (det. by B. Allen); head of Mill Creek, Mt. Sanhedrin, MNF, 7630; same locality, *Shevock 19469* (CAS). This species has leaves, which when spread flat, are about as broad as long and the leaf keel is curved throughout. [= *Fontinalis antipyretica*]

Fontinalis howellii Renaud & Cardot (Fontinalaceae). Rare. In shallow ponds in sun or shade. Tule Lake, Mt. Sanhedrin, MNF, 5116 (ver. by B. Allen); Summit Lake, MNF, 7643; Upper Nye Camp N of Snow Mtn. Wilderness boundary, *Shevock 15845* (CAS). This species has very long and narrow branch leaves.

Fontinalis hypnoides Hartman (Fontinalaceae). Infrequent. In sluggish stream and pond margin, sometimes attached to bases of willow trees. Rivulet above Blue Lakes at the Narrows, 538 (SFSU); Blue Slides Lake, MNF, 5261 (det. by B. Allen); Clear Lake State Park, Kelsey Creek Slough, 9859. Typically this species inhabits ponds and sluggish streams and is the only *Fontinalis* in the county with non-keeled leaves.

Fontinalis mollis Müller Hal (Fontinalaceae). Rare. In seasonal stream. Copsey Creek E of Lower Lake, 7330 (det. by B. Allen); Middletown at old St. Helena Bridge, 8937. This species has a similar leaf shape to that of *F. gigantea*, although the plants are smaller and occur at lower elevations. [= *Fontinalis antipyretica*]

Fontinalis neomexicana Sullivant & Lesquereux (Fontinalaceae). Rare. In shaded seasonal stream. Bucknell Creek below Streeter Ridge N of Horse Mtn., MNF, 7452 (det. by B. Allen), 7540; Grizzly Canyon N of Elk Mtn., MNF, 7680. This species can be recognized by its branch apices, which are strongly triangular in cross-section in addition to having abruptly apiculate perichaetial leaves.

****Funaria convexa** Spruce (Funariaceae). Rare. On rock outcrop near stream mixed with other mosses. Middle Creek Campground N of Upper Lake, MNF, 9613 (ver. by B. Allen). This species can be distinguished from *F. muhlenbergii* Turner by two characters of the operculum. It is convex, not at all mamillate and the border is a bright orange-red (Crundwell and Nyholm 1974). It was first reported from North America from Lake County, California (Toren 2008).

Funaria hygrometrica Hedwig (Funariaceae). Common. On disturbed soil and burns everywhere. Two mi N of Middletown, *Schofield 29003* (UBC); W slope of Goat Mtn., MNF, 7565; S end of Middletown, 7309; Upper Nye Camp, Snow Mtn. Wilderness boundary, MNF, 5166a.

Funaria muhlenbergii Turner (Funariaceae). Infrequent. On sunny soil over rock, often in crevices. Hells Peak, 1071 (SFSU); Old Long Valley Rd, 7370; Chalk

Mtn., North Fork of Cache Creek, 7328, E of Complexion Springs near Indian Valley Lake, 7297a.

Gemmabryum barnesii (J.B. Wood ex Schimper) J.R. Spence (Bryaceae). Rare. On sunny soil among grasses. Lincoln Rock along Socrates Mine Rd, 5107a; (det. by Vanderpoorten); Middletown at old St. Helena Creek bridge, 9408; South Fork of Scotts Creek, 0.3 mi. S of main stem confluence, 10165; Jerusalem Valley, confluence of Gunther Creek, 10275.

Gemmabryum caespiticium (Hedwig) J.R. Spence (Bryaceae). Rare. On sunny soil and rock. Pogie Point, Lake Pillsbury, MNF, 5081 (det. by J. Spence); base of Chalk Mtn., North Fork of Cache Creek, 7325.

Gemmabryum demaretianum (Arts) J.R. Spence (Bryaceae). Rare. On soil or soil over rock in sun, Hidden Valley at end of Conestoga Rd, 9386a; Big Canyon Rd between Howard Springs and Ettawa Springs, 9998a. The small, orange-brown rhizoidal tubers abundantly borne in clusters are diagnostic of this species (Arts 1992). It has been documented only recently from California.

Gemmabryum dichotomum (Hedwig) J.R. Spence & H.P. Ramsay (Bryaceae). Common. Mostly on sunny bare soil or among grasses. Hwy 20 at Nice, 7710; Library Park, Lakeport, 7666; Manning Creek, Hwy 175 W of Lakeport, 7002; Forest Rd M12 to Bartlett Mtn., 1.2 mi from Hwy 20, 9378.

Gemmabryum gemmilucens (R. Wilczek & Demaret) J. R. Spence (Bryaceae). Occasional. On sunny soil among grasses or cracks in pavement. Base of Chalk Mtn., North Fork Cache Creek, 7323 (det. by J. Spence); east shore of Clear Lake at town of Nice, 7710; Clear Lake State Park, along Kelsey Slough, 9854; N end of High Valley just S of MNF boundary, 8960. Spence (2014) reports this species in North America only from California. It is distinctive with its cylindric to spheric, yellow to brown bulbils with absent or very short primordia.

Gemmabryum klinggraeffii (Schimper) J.R. Spence [Bryaceae]. Rare. On compacted, disturbed clay soil in sun. South shore of Clear Lake, Big Valley Rancheria, 10301. This species has few documented sites in California but may be recognized by its small reddish rhizoidal tubers with protuberant cells.

***Gemmabryum kunzei** (Hornschuch) J.R. Spence (Bryaceae). Rare. In exposed rock crevices and on dry soil. NE Ridge of Snow Mtn. above N cirque, Snow Mtn. Wilderness, MNF, 9311; (coll. E. Dearing) (det. by J. Spence); east end of Clear Lake at Sulphur Bank Mine, *E. Laeger 3705* (CAS) (det. by J. Spence); Hull Mtn., headwaters of Rattlesnake Creek, S of summit ridge, MNF, 10235.

Gemmabryum subapiculatum (Hampe) J.R. Spence & H. P. Ramsay (Bryaceae). Rare. On bare soil, edge of wet meadow, Mill Creek, Mt. Sanhedrin, MNF, 8085. This is similar to *G. radiculosum* (Bridel) J.R. Spence & H.P. Ramsay but the basal leaf cells are rectangular.

Gemmabryum radiculosum (Bridel) J.R. Spence & H.P. Ramsay (Bryaceae). Rare. On sunny, compacted calcareous soil. Grizzly Springs, Hwy 20, nine mi E of

Hwy 53 jct, 9949. This species has red-brown rhizoidal tubers with non-protuberant cells and the basal leaf cells are quadrate.

Gemmabryum tenuisetum (Limpricht) J.R. Spence & H. P. Ramsay (Bryaceae). Rare. On sunny, bare soil. Snow Mtn. Wilderness, Cedar Camp, MNF, 1062 (SFSU); Sulphur Bank Mine, Clear Lake, 7280 (det. by J. Spence). This is told by its large, yellowish tubers.

Gemmabryum valparaisense (Thériot) J.R. Spence (Bryaceae). Rare. In rock crevices in diffuse light. W of Butte Rock and N of Morgan Valley, 8616 (ver. by J. Spence); east shore of Clear Lake along Hwy 20, four mi N of Glenhaven, 8064a; Pacific Ridge S of Goat Mtn. at Horse Rock, MNF, 7574. This is recognized by its small, brown, pyriform tubers.

Gemmabryum vinosum J.R. Spence & Kellman (Bryaceae). Occasional. On sedimentary, metavolcanic or volcanic rock, usually at lower elevations. Manning Creek, four mi W of Lakeport along Hwy 175, *Shevock & Mishler* 21925 (CAS); Goat Rock, two mi SW of Harbin Springs and two mi NW of Middletown, 10132; along Harrington Flat Rd E of Boggs Lake and S of Mt. Hannah, 9399; S banks of Eel River below Forest Rd M-1 and Logan Spring, 10087A. This recently described species (Spence and Kellman 2015) is best developed in diffuse light and can be recognized by its short-ovate and short-awned leaves which are tinted red mostly in the upper portions.

Gemmabryum violaceum (Crundwell & Nyholm) J.R. Spence (Bryaceae). Rare. On bare ash soil. N end of Bachelor Valley below Hells Peak, 843 (SFSU); Base of Konoti at Little Borax Lake, 7853; Bottlerock Rd near Sulphur Creek, *E. Dearing s.n.* The collection from Bachelor Valley is one of the few fruiting specimens known. At the time of its description, Crundwell and Nyholm (1963) mentioned seeing only three collections with sporophytes. It has violet rhizoids under transmitted light.

Grimmia alpestris (F. Weber & D. Mohr.) Schleicher (Grimmiaceae). Rare. On exposed rock at highest elevations. Hull Mtn. summit, MNF, 7237a (det. by R. Hastings); tributary to Bear Creek N of Cedar Camp, Snow Mtn. Wilderness, MNF, 9439 (det. by R. Hastings).

Grimmia anodon Bruch & Schimper (Grimmiaceae). Rare. On exposed rock at the highest elevations. Snow Mtn. Wilderness near Signal Peak, MNF, 1405 (SFSU); Snow Mtn. Wilderness, West Peak, MNF, 7472; Hull Mtn. above Timberline Camp, MNF, 7176a; summit, Sheetiron Mtn., MNF, 5187.

Grimmia caespiticia (Bridel) Juratzka (Grimmiaceae). Rare. On exposed rock at the highest elevations. Ridge N of East Peak, Snow Mtn. Wilderness, MNF, 7508 (det. by R. Hastings); Goat Mtn. just N of lookout, MNF, 9320 (det. by R. Hastings); Summit Springs Trail, Snow Mtn. Wilderness, 7478 (det. by R. Hastings).

Grimmia laevigata (Bridel) Bridel (Grimmiaceae). Common. On sunny rock up to 4000 ft. Manning Creek, four mi W of Lakeport on Hwy 175, 7340; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 7014; Clear Lake State Park, 6838; W of Lake

Pillsbury at the Slides, MNF, 5042. This species grows in dense, hoary tufts, which are firmly attached to the substrate. It has ovate-triangular leaves with broadly attached, spinulose awns. Capsules are only occasionally present.

Grimmia leibergii Paris (Grimmiaceae). Common. On shaded boulders and cliff faces mostly below 4000 ft. Two mi SW of Lake Pillsbury, S of Forest Rd M8, MNF, 7440 (ver. by J. Muñoz); Spikenard Creek, Boggs Mtn. State Forest, 7109; Hells Peak, 6865; Low Gap near Round Mtn., MNF, 7270. Lawton (1971) considered *G. leibergii* to be only a form of *G. trichophylla* Greville, but Muñoz (1999) showed it to be distinct. *Grimmia leibergii* and *G. trichophylla* can grow sympatrically and young colonies can cause confusion in the field.

Grimmia lisae De Notaris (Grimmiaceae). Common. On exposed to shaded rock and soil over rock. Along Big Canyon Creek Rd, E of Boggs Mtn. State Forest, 7284; Dashiells Creek W of Lake Pillsbury, MNF, 7262 (det. by J. Muñoz); one mi N of Middletown, 7306; Hells Peak, 6863. Typically this species grows on boulders near watercourses and has squarrose leaves when wet which are somewhat wider and less tapering than *G. trichophylla*. The capsules are usually brown and weakly striate. Some specimens are difficult to separate from the *G. trichophylla* without microscopic examination.

Grimmia mariniana Sayre (Grimmiaceae). Rare. On exposed to shaded volcanic or metavolcanic rock. E slope of Cobb Mtn., 7125 (ver. by J. Muñoz); S slope above Socrates Mine Rd, 7132; summit of Cobb Mtn., 7390; Butte Rock N of Morgan Valley near Yolo County line, 8601; Boggs Mtn. State Forest S of Calso Camp, 8931. Sayre (1955) described but did not illustrate the upper parts of the peristome teeth, which remain attached to the inner surface of the operculum.

Grimmia montana Bruch & Schimper (Grimmiaceae). Common. On exposed rock, all elevations. North Cow Mtn. BLM Recreation Area, Mendo Rock, 6935 (ver. by J. Muñoz); Hull Mtn., Timberline Camp, MNF, 7179; Boggs Mtn. State Forest, 7110; Snow Mtn. Wilderness, Summit Springs trail, 7457.

Grimmia nevadensis Greven (Grimmiaceae). Rare. On exposed rock. Summit area of Hull Mtn. S of lookout, MNF, 7237 (det. by R. Hastings). Greven (2002) described this species and reported occurrences only from southern and eastern Sierra Nevada counties.

Grimmia ovalis (Hedwig) Lindberg (Grimmiaceae). Occasional. Summit Springs Trail S of Cedar Camp, Snow Mtn. Wilderness, MNF, 9437 (det. by R. Hastings); W of Low Gap and S of Sheetiron Mtn., MNF, 9483a; Bartlett Mtn. just N of Pinnacle Rock, MNF, 9623; Butte Rock near Yolo County line, 8609 (det. by R. Hastings); Rattlesnake Creek below Hull Mtn. summit, *Ma 14-5874* (CAS, KUN).

Grimmia pulvinata (Hedwig) Smith (Grimmiaceae). Common. On exposed to shaded rock, often on concrete and tombstones. Clear Lake State Park, 7166; Bartlett Springs, MNF, 8138; Upper Lake Cemetery, 7446; one mi N of Middletown, 7304. This species is

easily recognized by its rounded hoary cushions and capsule with rostrate operculum on an arcuate seta.

Grimmia ramondii (Lamark & de Candolle) Margadant (Grimmiaceae). Infrequent. On shaded boulders at higher elevations. Tributary to Stony Creek, Snow Mtn. Wilderness, MNF, 5344; headwaters of Mill Creek, Mt. Sanhedrin, MNF, 7222, 8033; N slope of Kneecap Ridge, tributary to Sheep Creek, MNF, 8834; near West Crockett Campground, Snow Mtn. Wilderness, MNF, 9496. This montane species forms loose, dark green patches and the leaves lack hair points. The diagnostic character is the groove running along the back of the costa, forming two wings that can be seen with a 20× hand lens.

Grimmia serrana J. Muñoz, Shevock & D.R. Toren (Grimmiaceae). Rare. On exposed metavolcanic outcrops subject to runoff in coniferous forest. Big Rock N of Deer Valley and E of Elk Mtn., MNF, 8002, 8657; 5.5 mi NE of Upper Lake and one mi SW of High Glade Lookout, MNF, 8478 (det. by Muñoz); Forest Rd M12 SE of Pinnacle Rock, Bartlett Mtn., 9384; unnamed rock outcrop, headwaters of Cold Creek, two mi N of Crockett Peak, 9892. This recently described species (Muñoz et al. 2002) is distinguished by the presence of multi-stratose marginal bands that are rounded in cross-section.

Grimmia torenii Hastings (Grimmiaceae). Infrequent. On calcareous, metavolcanic rock outcrops, mostly below 3500 ft elevation. Hells Peak, 778 (SFSU), 6857; Forest Rd M1, Eel River crossing below Lake Pillsbury, MNF, 7357; W of Lake Pillsbury at the slides, MNF, 8089; Big Canyon Rd S of Howard Springs, 9389 (all ver. by R. Hastings). Since its description (Hastings 2008), *G. torenii* has also been collected in San Mateo County, *Kellman 6050* (CAS).

Grimmia torquata Drummond (Grimmiaceae). Occasional. On rather shaded rock faces, often in seepy recesses, up to 5000 ft. Along Forest Rd M1 at Eel River crossing below Lake Pillsbury, 7439; High Rock E of Hull Mtn., MNF, 8110; Rd to Summit Lake, MNF, 7196; Hells Peak, 625 (SFSU). Sporophytes of *G. torquata* are very rare worldwide. The Eel River locality is the only fruiting population the author has seen in the county.

Grimmia trichophylla Greville (Grimmiaceae). Common. On exposed rock, up to 6000 ft. Copsey Creek E of Lower Lake, 7321; E slope of Cobb Mtn., 7133; Summit Springs Trail, Snow Mtn. Wilderness, MNF, 7518; North Cow Mtn. BLM Recreation Area, Glen Eden Trail, 6990. This species is often confused with *G. lisae*, but the capsules are stramineous, more oblong-ovoid and more strongly striate. It is the most common *Grimmia* on serpentine substrates.

Gymnostomum aeruginosum Smith (Pottiaceae). Rare. On shaded rock overhangs. N cirque, Snow Mtn. Wilderness, MNF, 9171 (det. by P. Eckel, R. Zander). Zander et al. (2007) cited specimens of *G. calcareum* Nees & Hornschuch and *G. viridulum* Bridel from Lake County. The above specimen from Snow Mtn. was examined after that publication (Zander, personal communication, 2008).

Gymnostomum calcareum Nees & Hornschuch (Pottiaceae). Rare. On shaded, calcareous rock crevices and moist rock along streams. Anderson Creek below Socrates Mine Rd, 8919; W of Low Gap and S of Sheetiron Mtn., MNF, 7717a.

****Gymnostomum viridulum** Bridel (Pottiaceae). Infrequent. In calcareous rock crevices. Hells Peak, N end of Bachelor Valley, 6866; High Rock E of Hull Mtn. off of Forest Rd 20N16, 8114; vicinity of Butte rock N of Morgan Valley, 8611; W of Low Gap and S of Sheetiron Mtn., 7717. The presence of gemmae, among other characters, separates this species from *G. calcareum* (Zander et al. 2007).

Hedwigia detonsa (M. Howe) W.R. Buck & D.H. Norris (Hedwigiaceae). Common. On shaded to exposed rock. N end of Bachelor Valley, S of Hells Peak, 6860; North Cow Mtn. BLM Recreation Area below CDF water tank, 6956; Knoxville BLM Recreation Area near Morgan Valley, 7048; Big Rock N of Deer Valley, MNF, 8005. *Hedwigia detonsa* can be distinguished from *H. stellata* in the field by its eciliate perichaetial leaves (Buck and Norris 1996).

Hedwigia stellata Hedenäs (Hedwigiaceae). Infrequent. On shaded to exposed rock. North Cow Mtn. Recreation Area, Glen Eden Trail, 6992; E slope Cobb Mtn., 7122; Stony Creek, Snow Mtn. Wilderness, MNF, 7609; serpentine ridge, Complexion Springs, *Sigal 164* (SFSU).

Hennediella heimii (Hedwig) R.H. Zander (Pottiaceae). Rare. On moist bare soil. End of Bachelor Valley Rd near Hells Peak, 839 (SFSU) (ver. by R. Zander); S shore of Clear Lake at Jago Bay, 7382; S shore of Clear Lake at Konocti Bay, 8987.

Hennediella stanfordensis (Steere) Blockeel (Pottiaceae). Rare. On shaded garden soil, compacted soil along footpaths and edges of rodent burrows. N end of Bachelor Valley near Hells Peak, 1074 (SFSU); Library Park, Lakeport, 9051; Middle Creek Campground at base of Elk Mtn., MNF, 9352. Steere (1951) originally named this moss *Tortula stanfordensis* Steere. In California it is found near human habitations and is always sterile.

Homalothecium aeneum (Mitten) E. Lawton (Brachytheciaceae). Rare. On dead wood. The Big Openings along Cedar Creek, MNF, 8765; same locality, 8766; (ver. by L. Hedenäs); S slope of Sheetiron Mtn., W of Low Gap, MNF, 5176 (det. by L. Hedenäs).

Homalothecium arenarium (Lesquereux) E. Lawton (Brachytheciaceae). Infrequent. On shaded boulders. S base of Mt. Konocti at Clear Lake State Park, 7039; Rodman Slough, N shore of Clear Lake, 8717; Boggs Mtn. State Forest near Grouse Spring, 8929; Siegler Creek Canyon E of Hoberg's airport, 9291a. This is the least pinnately branched species of the genus in the county.

Homalothecium californicum Hedenäs, Huttunen, Shevock & D.H. Norris (Brachytheciaceae). Infrequent. On shaded boulders and tree bases. Ericson Ridge, Mt. Sanhedrin, MNF, 5096; S slope of Sheetiron Mtn. W of Low Gap, MNF, 5177; tributary to Hull Creek W

of High Rock, MNF, 8119 (ver. by L. Hedenäs); Crabtree Hot Springs, MNF, 5245 (ver. by L. Hedenäs). This robust plant has been confused in the past with *Homalothecium aeneum* but Hedenäs et al. (2009) showed it to be distinct with both molecular evidence and morphological traits.

Homalothecium nevadense (Lesquereux) Renaud & Cardot (Brachytheciaceae). Occasional. On shaded or sunny rock at higher elevations, rarely on tree bases. S slope of Sheetiron Mtn. W of Low Gap, MNF, 5176; Ericson Ridge, Mt. Sanhedrin, MNF, 5070 (ver. by L. Hedenäs); E slope of Cobb Mtn., 7388; Snow Mtn. Wilderness, MNF, 7501 (ver. by L. Hedenäs).

Homalothecium nuttallii (Wilson) A. Jaeger (Brachytheciaceae). Common. On shaded bark of hardwoods, rarely on rock. E slope of Cobb Mtn., 7392; W of Goat Mtn. along Wyman Creek, MNF, 7544; Soda Creek W of Lake Pillsbury, MNF, 5130; near Hells Peak, 295 (SFSU).

Homalothecium pinnatifidum (Sullivant & Lesquereux) E. Lawton (Brachytheciaceae). Common. On shaded soil mixed with other mosses, often on steep banks. North Cow Mtn. BLM Recreation Area, 6934; Lincoln Rock along Socrates Mine Rd, 5038d; Soda Creek W of Lake Pillsbury, MNF, 5129a; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 7018.

Hygroamblystegium tenax (Hedwig) Jennings (Amblystegiaceae). Occasional. Semiaquatic, in small streams and dripping springs. Spring at the Narrows, Blue Lakes, 540 (SFSU); Anderson Springs S of Cobb Mtn., 7169; Elk Canyon, west base of Middle Mtn., 473 (SFSU); Hwy 20, four mi N of Glenhaven, 8062. [= *Hygroamblystegium varium* (Hedwig) Mönkemeyer var. *varium*]

Hygrohypnum bestii (Renaud & Bryhn) Holzinger (Campyliaceae). Occasional. In perennial streams, submerged or in splash zones. Snow Mtn. Wilderness, MNF, 7476; W slope Goat Mtn., Wyman Creek, MNF, 7564; Boggs Mtn. State Forest, Big Spring, 7108; Dashiells Creek, S of Mt. Sanhedrin, 7182 (det. by D. Jamieson).

Hymenostylium recurvirostrum (Hedwig) Dixon (Pottiaceae). Rare. On damp to wet, calcareous rock. Hells Peak at base of waterfall, 930; Stony Creek waterfall NW of Milk Ranch, Snow Mtn. Wilderness, MNF, 9306 (ver. by R. Zander).

Hypnum circinale Hooker (Hypnaceae). Infrequent. On shaded rotten logs and tree bases; present only in coniferous forest. Tule Lake, Mt. Sanhedrin, MNF, 1278 (SFSU); Summit Lake, MNF, 7202; Forest Rd 18N14 from M1, MNF, 7975; Jones Creek, Boggs Mtn. State Forest, 7289.

Hypnum subimponens Lesquereux (Hypnaceae). Occasional. On shaded logs, boulders, and soil, often near streams. Bear Creek Campground, MNF, 5273; Alder Creek, Cobb Mtn., 7100; Horse Creek along Forest Rd M-6, MNF, 8104; Clear Lake State Park, 7160.

Imbribryum alpinum (Hudson ex Withering) N. Pederson (Bryaceae). Rare. On wet soil along stream. N cirque, Snow Mtn. Wilderness, MNF, 9170 (ver. by J. Spence). This species is similar to *I. mildeanum* (Juratzka) J.R. Spence, but the plants are red-tinged and the leaves are recurved below. Also, the upper leaf cells are thick-walled and vermicular, more than 6:1.

Imbribryum gemmiparum (De Notaris) J.R. Spence (Bryaceae). Common. On soil or rock along small calcareous streams. Soda Creek, Lake Pillsbury, MNF, 5131 (ver. by J. Spence); Carter Glade above Clover Creek, MNF, 7987; Snow Mtn. Wilderness, Stony Creek, MNF, 7614a; Grizzly Canyon N of Elk Mtn., MNF, 7957.

Imbribryum microchaeton (Hampe) J.R. Spence (Bryaceae). Rare. On sunny soil over travertine rock in runoff area. Chalk Mtn. along North fork of Cache Creek, 9980 (ver. by J. Spence). This shiny green species with its very long laminal cells resembles a *Pohlia* Hedwig, but the costa is long excurrent. The first Californian record of this species is from the Santa Monica Mts. in Ventura County (Sagar and Wilson 2007).

Imbribryum mildeanum (Juratzka) J.R. Spence (Bryaceae). Rare. On bare, wet soil of roadside ditch. Along Forest Rd M3 at Rd 18N51 jct, Snow Mtn. Wilderness, MNF, 9940 (ver. by J. Spence). This distinctive species grows in dense yellow-green tufts. Its shoots are imbricate wet or dry and the leaves have a shortly excurrent costa. Spence (2007) reported it new for North America from Colorado.

Imbribryum miniatum (Lesquereux) J.R. Spence (Bryaceae). Infrequent. On wet rocks in streams. North Cow Mtn. BLM Recreation Area, Eight Mile Valley, 7019 (ver. by J. Spence); drainage above Sky Rock below High Glade Lookout, MNF, 8741; Big Rock N of Deer Valley and E of Elk Mtn., MNF, 8661; Elk Mtn., along Forest Rd M1 below summit, 9476.

Imbribryum muchlenbeckii (Bruch & Schimper) Pedersen (Bryaceae). Rare. On vertical chert wall with drainage in sun, headwaters of Rattlesnake Creek S of Hull Mtn. summit ridge, MNF, 10237 (coll. E. Dearing); same locality, *Shevock 45875 & 45879* (CAS) (ver. by J. Spence).

Imbribryum torenii J.R. Spence & Shevock (Bryaceae). Occasional. On soil or soil over rock, usually in open sites with runoff. High Valley N of Clear Lake, 8958; Manning Creek, four mi W of Lakeport along Hwy 175, 9579; Jerusalem Grade Rd, just W of Soda Creek, 9987. This species, widespread in western North America, was described only recently (Spence and Shevock 2015).

Isopterygiopsis pulchella (Hedwig) Z. Iwatsuki (Hypnaceae). Rare. On shaded soil and exposed roots along stream. Headwaters of Bear Creek, Snow Mtn. Wilderness, MNF, 9447.

Isothecium cristatum (Hampe) H. Robinson (Lembohyllaceae). Occasional. On shaded soil, rocks, and bases of conifers. Pogie Point Campground, Lake Pillsbury, MNF, 5047a; Summit Lake, MNF, 7199; E slope, Cobb Mtn., 7398; summit of Mt. Konocti, 7859.

Isoetecium stoloniferum Bridel (Lembophyllaceae). Common. On shaded soil, boulders, and tree trunks. Summit Lake, MNF, 7216; Clear Lake State Park, 7158; N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7418; Lower Nye Camp, Snow Mtn. Wilderness, MNF, 5333.

Kindbergia oregana (Sullivant) Ochyra (Brachytheciaceae). Occasional. On shaded soil and over duff and rotten logs, usually in coniferous forest, rarely in mixed evergreen forest. Old county Rd, Blue Lakes, 5015; Rd to Red Mtn. Camp, South Cow Mtn. BLM Recreation Area, 6918; Summit Lake, MNF, 7206; near summit Mt Konocti, 7882.

Kindbergia praelonga (Hedwig) Ochyra (Brachytheciaceae). Common. Along shaded streams and springs, sometimes invading lawns. Schwartz Spring, Cobb Mtn., 5210; Violet Spring, Log Ridge, MNF, 5286; bottom of Streeter Ridge along Bucknell Creek, MNF, 7453; Ericson Ridge, Mt. Sanhedrin, MNF, 5108.

Leptobryum pyriforme (Hedwig) Wilson (Meesiaceae). Infrequent. On moist to wet soil. Jct of Hwy 20 and Main Street, Upper Lake, 7986; Rd to Addington Springs W of Goat Mtn., MNF, 7551; roadside along Corbin Creek, MNF, 5135b; N cirque, Snow Mtn. Wilderness, MNF, 9162. Tending to be a weedy moss, this is unmistakable in its filiform leaves and nodding, pyriform capsules. The stems at the base are nearly always blackish.

Leptodietyum humile (Palisot de Beauvois) Ochyra (Amblystegiaceae). Rare. On bark of willow in part shade. East shore of Clear Lake at Lucerne, 8878 (ver. J. Janssens). [= *Hygroamblystegium varium* var. *humile* (P. Beauv.) Vanderp. & Hedenäs]

Leptodietyum riparium (Hedwig) Warnstorf (Amblystegiaceae). Infrequent. In sluggish water in streams, also lakeshores, attached to wood or rock. Blue Lakes near the Narrows, 524 (SFSU); Goat Mtn. S of Addington Springs, MNF, 7555; Hunting Creek, McLaughlin UC Reserve near Morgan Valley, 8621; Robinson Creek crossing Bridge Arbor Rd, 8664.

Leucolepis acanthoneura (Schwägrichen) Lindberg (Mniaceae). Infrequent. On moist to wet, shaded rocks, soil, and tree bases along streams. Alder Creek, Cobb Mtn., 7088; N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7406; Ericson Ridge, Mt Sanhedrin, MNF, 5100; Grizzly Canyon N of Elk Mtn., MNF, 7961. This is the only dendroid moss of wet habitats in the county and is far less common than along the coast.

Meiotrichum lyallii (Mitten) G.L. Merrill (Polytrichaceae). Rare. On damp soil of pond margin in Red Fir Forest. Snow Mtn. Wilderness at Cedar Camp, MNF, 1399 (SFSU); same locality, 7491.

Metaneckera menziesii (Drummond) Steere (Neckeraaceae). Occasional. On shaded boulders (especially beneath overhangs) and hardwood tree bases. Ericson Ridge, Mt. Sanhedrin, MNF, 5117; Horse Creek E of Hull Mtn., MNF, 8105; Crabtree Hot Springs, MNF, 5238; Jones Creek, Boggs Mtn. State Forest, 7291. This is a spectacular moss, which forms mats of complanate shoots with undulate leaves, sometimes becoming flagelliform. [= *Neckera menziesii* Drummond]

Microbryum starckeanum (Hedwig) R.H. Zander (Pottiaceae). Rare. On sunny, dry soil over rock in oak woodland. N end Bachelor Valley S of Hells Peak, 786 (SFSU, UC); Hwy 20, four mi N of Glenhaven, 8064.

Mielichhoferia elongata (Hoppe & Hornschuch ex Hooker) Nees & Hornschuch (Mielichhoferiaceae). Rare. On shaded, moist bare soil around sulfur hot springs. Anderson Springs S of Cobb Mtn., 7256 (ver. by J. Shaw). The peculiar blue-green color of its tufts is distinctive. Other suitable habitats in the county for this rare moss do not seem to exist.

Mnium marginatum (Dickson ex Withering) Palisot de Beauvois (Mniaceae). Rare. In damp rock crevice in shade and in splash zone of falling water. N cirque between East Peak and Signal Peak, Snow Mtn. Wilderness, MNF, 9173; Waterfall along Stony Creek NW of Milk Ranch, Snow Mtn. Wilderness, MNF, 9307 (coll. E. Dearing).

Mnium thomsonii Schimper (Mniaceae). Rare. On wet rotten wood along stream. Alder Creek, Cobb Mtn., 7089 (det. by R. Wyatt).

Neckera douglasii Hooker (Neckeraaceae). Infrequent. On shaded hardwood bark, also on bark of Pacific yew, *Taxus brevifolia* Nuttall. North Cow Mtn. Recreation Area, 6941; Summit Lake, MNF, 7215; tributary to Bucknell Creek S of Little Round Mtn., MNF, 7453a; Grizzly Canyon N of Elk Mtn., MNF, 7687. Populations of this are very small in the county, mostly occurring at the more humid extreme bases of tree boles.

Niphotrichum elongatum (Ehrhart ex Frisvoll) Bednarek-Ochyra & Ochyra (Grimmiaceae). Rare. On sunny, disturbed soil in chaparral areas. South Cow Mtn. BLM Recreation Area near Fountain of Youth Camp, 6925; same area as above, N end of Eight Mile Valley, 7009; E of Lake Pillsbury S of Squaw Valley and N of Horsepasture Gulch, MNF, 9190. This species forms short, hoary tufts and is more common toward the coast and northward. Its hairpoints are bent back when dry and are conspicuously decurrent.

Nogopterium gracile (Hedwig) Crosby & W.R. Buck (Leucodontaceae). Common. On boulders, cliffs, and tree bases in open shade. North Cow Mtn. BLM Recreation Area, 6983; Clear Lake State Park, 6830; Crabtree Hot Springs, MNF, 5244; old toll road W of Highland Springs, 7900. This moss was previously known as *Pterogonium gracile* (Hedwig) Smith and is easily recognized by branches that are curved downward in the same direction resembling a bird's foot.

Orthodicranum tauricum (Sapjegin) Smirnova (Dicranaceae). Occasional. On shaded rotten logs, bases of Douglas fir trees, rarely on shaded rock. Alder Creek, Cobb Mtn., 7093; Pogie Point Campground, MNF, 5046; Ericson Ridge, Mt. Sanhedrin, MNF, 5094; Forest Rd 18N14 from M1, MNF, 7977. The distinctive features of this moss include the dense, erect, dark green tufts with broken leaf tips

Orthotrichum affine Bridel (Orthotrichaceae). Rare. On hardwood or conifer bark, higher elevations. Mill

Creek, Mt. Sanhedrin, MNF, 7143; beginning of Bear Wallow trail at Low Gap, MNF, 7727.

Orthotrichum alpestre Hornschuch ex Bruch & Schimper (Orthotrichaceae). On shaded metavolcanic rock. Tributary to Bear Creek N of Cedar Camp, Snow Mtn. Wilderness, MNF, 9443. This is one of the rarest *Orthotrichum* Hedwig species in the county. Vitt (1973) did not map any occurrences in the North Coast Ranges.

Orthotrichum bolanderi Sullivant (Orthotrichaceae). Occasional. On exposed rock, lower elevations. Carter Glade near Clover Creek, MNF, 7993; Clear Lake State Park, 7037; Hells Peak, 553 (SFSU); Knoxville BLM Recreation Area near Rieff Rd jct, 7060. The distinctive plane leaf margins of this moss can be seen with a 20× hand lens.

Orthotrichum columbicum Mitten (Orthotrichaceae). Rare. On shaded bark of maple. Ericson Ridge, Mt. Sanhedrin, MNF, 7147 (det. by R. Garilleti).

Orthotrichum consimile Mitten (Orthotrichaceae). Rare. On hardwood bark (alder and maple) in open shade. Summit Lake, MNF, 7212; Grizzly Canyon N of Elk Mtn., MNF, 7697.

Orthotrichum cupulatum Bridel (Orthotrichaceae). Infrequent. On exposed rock, upper elevations. Summit Springs Trail, Snow Mtn. Wilderness, MNF, 7460; High Rock near Eel River, MNF, 8116; Low Gap S of Sheetiron Mtn., MNF, 7728.

Orthotrichum cylindrocarpum Lesquereux (Orthotrichaceae). Rare. On shaded bark of white alder and California bay. Swartz Spring, east base of Cobb Mtn. above town of Cobb, 9732; Boggs Mtn. along Houghton Creek, 9733.

Orthotrichum hallii Sullivant & Lesquereux (Orthotrichaceae). Rare. On sunny, calcareous rock. Knoxville BLM Recreation Area near Round Mtn., 7061, (det. by J. Harpel).

Orthotrichum laevigatum J.E. Zetterstedt (Orthotrichaceae). Occasional. On exposed to shaded rock at higher elevations. Hull Mtn. summit, MNF, 460 (SFSU) (ver. by D. Vitt); Cobb Mtn. summit, 7397; Sheetiron Mtn. summit, MNF, 5184; Snow Mtn. Wilderness near summit, MNF, 7477.

Orthotrichum lyellii Hooker & Taylor (Orthotrichaceae). Common. On hardwood or conifer bark, up to 6000 ft. Cobb Mtn. summit, 7397; near Hells Peak, 304 (SFSU); Hull Mtn., MNF, 463 (SFSU); Summit Lake, MNF, 7211. Along with *Antitrichia californica*, this is the most common epiphytic moss in the county.

Orthotrichum obtusifolium Bridel (Orthotrichaceae). Infrequent. On hardwoods, oak, buckeye, maple, and poplar in open shade. Mill Creek, Mt. Sanhedrin, MNF, 7145; Blue Slides Lake, MNF, 5263; Summit Springs trailhead, Snow Mtn. Wilderness, MNF, 7522; S of Hells Peak, 1039 (SFSU).

Orthotrichum norrisii F. Lara, R. Medina, & Garilleti (Orthotrichaceae). Common. On sunny bark of oaks, buckeye, and other hardwoods, low elevations. Hwy 153

one mi S of Hwy 20, 7366; Anderson Marsh State Historic Park, 6810; Clear Lake State Park, 6855; N end of Bachelor Valley S of Hells Peak, 975 (SFSU) (dets. by F. Lara and R. Garilleti). Medina et al. (2008) determined that *O. norrisii* differs from *O. tenellum* Bruch ex Bridel mainly in having narrower exothecial bands.

Orthotrichum pellucidum Lindberg (Orthotrichaceae). Rare. On shaded, upper elevation calcareous rock. Goat Mtn., side of road just N of lookout, MNF, 9319 (det. by F. Lara).

Orthotrichum persimile F. Lara, R. Medina & Garilleti (Orthotrichaceae). Rare. On shaded bark of bigleaf maple, Mt. Sanhedrin, Ericson Ridge, along Forest Rd 20N04, MNF, 10232.

Orthotrichum pylaisii Bridel (Orthotrichaceae). Rare. On exposed rock, higher elevations. Goat Mtn. summit, MNF, 5248 (det. by D. Norris, F. Lara); Snow Mtn. Wilderness S of Maloney Falls, MNF, 7604 (det. by F. Lara). This montane species was mapped for the Sierra Nevada (Vitt 1973) but not for the North Coast Ranges.

Orthotrichum rivulare Turner (Orthotrichaceae). Common. On rock, mostly in intermittent streams, up to 5000 ft. Big Canyon Creek Rd, 7283; Eel River at High Rock, MNF, 5066; Scott Dam, Lake Pillsbury, MNF, 7139; W of Low Gap, S of Sheetiron Mtn., MNF, 7719.

Orthotrichum rupestre Schleicher ex Schwägrichen (Orthotrichaceae). Common. On rock in open shade, rarely on bark. Dashiells, Mt. Sanhedrin, *A. Eastwood* s.n. (CAS); Bartlett Mtn. at Sawmill Flat, MNF, 5233; North Cow Mtn. BLM Recreation Area, 6936; Knoxville BLM Recreation Area, 7056. This is a most variable species.

Orthotrichum schimperi Hammar (Orthotrichaceae). Infrequent. On sunny bark of oak, apple, and walnut. Indian Valley Reservoir, 7295; S end of Middletown, 7250a; Upper Lake Ranger Sta., 7473 (dets by F. Lara, R. Garilleti). This inconspicuous moss is the smallest corticolous species of the genus in the county.

Orthotrichum shawii Wilson (Orthotrichaceae). Rare. On exposed metavolcanic rock. Headwaters of Cold Creek two mi N of Crockett Peak, Snow Mtn. Wilderness, MNF, 9891 (ver. by R. Garilleti). This species was first collected in California by H.N. Bolander without a specific locality and the record was subsequently overlooked and forgotten (Garilleti et al. 2006). It resembles members of the *O. rupestre* complex but has slightly ribbed capsules. Mazimpaka et al. (2000) illustrated a distinctive sporophytic character in *O. shawii*, differential thickening of longitudinal walls of the exothecium, which resemble wavy bands.

Oxyrrhynchium hians (Hedwig) Loeske (Brachytheciaceae). Rare. On soil over rock in part shade. E slope of Cobb Mtn., along Hwy 175 at town of Cobb, 7097 (det. by M. Ignatov).

Phascum cuspidatum Hedwig (Pottiaceae). Occasional. On sunny, bare soil, usually in disturbed areas. Two mi N of Middletown, *Schofield* 29002 (UBC); S of Hells Peak, 658 (SFSU); Hwy 53 one mi S of Hwy

20, 7322; South Cow Mtn. BLM Recreation Area, 7034. [= *Tortula acaulon*]

Philonotis americana Dismier (Bartramiaceae). Occasional. In wet meadowy areas at higher elevations. Cedar Camp, Snow Mtn. Wilderness, MNF, 7483; Corbin Creek, MNF, 5058f; Ericson Ridge, Mt. Sanhedrin, MNF 7151; Kneecap Ridge, along M6 E of Forest Rd 20N09, 8845.

Philonotis capillaris Lindberg (Bartramiaceae). Occasional. On shaded, seepy banks, often on roadcuts. Ericson Ridge, Mt. Sanhedrin, MNF, 5076; Blue Lakes, old county road, 7430a; Camel Back Ridge along Bottlerock Rd, 7007 (ver. by D. Griffin III); S of Hells Peaks, 1045 (SFSU).

Philonotis fontana (Hedwig) Bridel (Bartramiaceae). Common. In moist situations in sunny meadows, stream banks, and springs. South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 6892 (ver. by D. Griffin III); S of Hells Peak, 432 (SFSU); N of Lake Pillsbury on Hull Mtn. Rd, 462 (SFSU); Deer Valley Campground, MNF, 8011.

Philonotis pumila Kindberg (Bartramiaceae). Rare. In wet meadows and springs above 5000 ft. N cirque of Hull Mtn., MNF, 7231; S slopes of Sheetiron Mtn., Forest Rd M3, *Shevock 15870* (CAS); headwaters of Rattlesnake Creek S of Hull Mtn. summit, *Ma 14-5871* (CAS, KUN); Mt. Sanhedrin, headwaters of Mill Creek, 10213.

Physcomitrella patens (Hedwig) Bruch & Schimper (Funariaceae). Rare. On wet soil in pastureland. Big Valley, Soda Bay Rd near Thompson Creek, 7857.

Physcomitrium californicum E. Britton (Funariaceae). Infrequent. On sunny bare soil and margins of wet meadows. Upper Nye Camp, Snow Mtn. Wilderness, MNF, *Shevock 15843* (CAS); meadow E of Hells Peak, 431 (SFSU); Loch Lomond along Hwy 175, 7445; above S shore of Lake Pillsbury near Lake Pillsbury Resort, MNF, 9358.

Physcomitrium pyriforme (Hedwig) Hampe (Funariaceae). Rare. On saturated soil of meadow. E of Lake Pillsbury, one mi SE of Big Squaw Valley, MNF, 9785.

Plagiobryoides vinosula (Cardot) J.R. Spence (Bryaceae). Rare. On wet clay soil over rock in calcareous meadow. Walker Ridge at Cold Spring east and upslope from Indian Valley Reservoir, 9871 (ver. by J. Spence); Rodman Slough County Park, south of Nice cutoff road, 10307. This is mainly a tropical species. Few North American records are known, with only a few other California localities documented.

Plagiomnium insigne (Mitten) T.J. Koponen (Mniaceae). Rare. On wet, shaded soil along streams. S of Summit Lake, MNF, 7210 (ver. by R. Wyatt); Grizzly Canyon N of Elk Mtn., MNF, 7679.

Plagiomnium medium (Bruch & Schimper) T.J. Koponen (Mniaceae). Infrequent. In wet meadows and along streams. Boggy area beyond turnoff to Tule Lake, Mt. Sanhedrin, MNF, 7186 (det. by R. Wyatt); Upper Nye Camp, boundary of Snow Mtn. Wilderness, MNF,

5156; Alder Creek, Cobb Mtn., 7080 (det. by R. Wyatt); Headwaters of Bear Creek, Snow Mtn. Wilderness, MNF, 7493.

Plagiomnium venustum (Mitten) T.J. Koponen (Mniaceae). Occasional. On shaded banks, boulders, and tree bases. Grizzly Canyon N of Elk Mtn., MNF, 7693; Ericson Ridge, Mt. Sanhedrin, MNF, 5113; Spikenard Creek, Boggs Mtn. State Forest, 7105; Clear Lake State Park, 6833.

Plagiothecium laetum Schimper (Plagiotheciaceae). Rare. On shaded soil and over rotten wood. N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7414; tributary of Dashiells Creek S of The Big Openings, 8161; near Forest Rd 18N25 along Packsaddle Creek, MNF, 9311a. This is another example of a moss that is more common in coastal California. The Lake County populations are very small.

Platydictya jungermannioides (Bridel) H.A. Crum (Hypnaceae). Rare. In shaded moist rock crevices and damp rotten wood along streams, Snow Mtn. Wilderness, MNF, Stony Creek NW of Milk Ranch, 9156; N cirque, tributary to Stony Creek, 9172. This is the smallest pleurocarpous moss in the county, which forms dull-green thin mats of threadlike shoots in calcareous areas.

Pleuridium acuminatum Lindberg (Ditrichaceae). Common. On sunny, bare, or disturbed soil, often in grassland areas. Hidden Valley N of Middletown, 7372 (det. by J. Yip); Manning Creek, four mi W of Lakeport, 7003; South Cow Mtn. BLM Recreation Area, Eight Mile Valley, 7347a; S of Hells Peak, 657 (SFSU).

Pleuridium subulatum (Hedwig) Rabenhorst (Ditrichaceae). Rare. On moist soil, edge of vernal marsh. Loch Lomond near Adams Springs, 7444 (det. by J. Yip).

Pohlia bolanderi (Lesquereux) Brotherus (Mniaceae). Rare. On shaded soil at base of red fir. Stony Creek NW of Milk Ranch, Snow Mtn. Wilderness, MNF, 9158.

Pohlia camptotrachela (Renaud & Cardot) Brotherus (Mniaceae). Infrequent. On damp bare soil at higher elevations. Summit Lake, MNF, 7207; Hull Mtn., N cirque, MNF, 7229 (det. by J. Shaw); Snow Mtn. Wilderness near Cedar Camp, MNF, 7482; Tule Lake, Mt. Sanhedrin, MNF, 9111. This plant has small axillary gemmae borne in clusters near the shoot tip, which can be seen with a 10× hand lens.

Pohlia longibracteata Brotherus (Mniaceae). Rare. On shaded moist siltstone in seasonal drainage gully. Boggs Mtn. State Forest, tributary to Spikenard Creek, 9960. According to Malcolm et al. (2009), This *Pohlia* becomes rare inland. All but one collection (*Shevock & Toren 20734*, Nevada County) cited in Norris and Shevock (2004) are from the coastal fog belt.

Pohlia nutans (Hedwig) Lindberg (Mniaceae). Rare. On bare, acidic soil and decayed logs. Clear Lake at Sulphur Bank Mine, 7278; sulfur hot spring at

Anderson Springs, 7257 (ver. by J. Shaw); just S of Milk Ranch, Snow Mtn. Wilderness, MNF, 9147.

Pohlia pacifica Shaw (Mniaceae). Rare. On damp, shaded, acidic soil of roadcut. Between Summit Lake and Smokehouse Creek, MNF, 7651 (ver. by J. Shaw). Shaw (1982) reported sites in California for this *Pohlia* only along the coast. The Lake County site is about forty mi inland.

Pohlia wahlenbergii (F. Weber & D. Mohr) A.L. Andrews (Mniaceae). Common. On wet soil in seeps, meadows, and along streams. Tributary to Corbin Creek, MNF, 5135h; North Cow Mtn. Recreation Area, headwaters of Scotts Creek, 6972; Forest Rd M10 near Blue Slides Lake, MNF, 5271; county Rd 122 along Asbill Creek N of Middletown, 7732.

Polytrichum juniperinum Hedwig (Polytrichaceae). Common. On sunny or shaded, usually bare soil. Alder Creek, Cobb Mtn., 7091; N cirque, Hull Mtn., 7243; Sulphur Bank Mine, Clear Lake, 7279; one mi E of The Slides, W of Lake Pillsbury, 5093.

Polytrichum piliferum Hedwig (Polytrichaceae). Common. On soil over rock in exposed places. Hells Peak, 6856; North Cow Mtn. BLM Recreation Area, Mendo Rock, 6937; Chalk Mtn. summit, north fork Cache Creek, 7318; Pitney Ridge below McCabe Point, MNF, 8074.

Porotrichum bigelovii (Sullivant) Kindberg (Neckeraceae). Infrequent. Along shaded streams in splash zones, on rock or on soil in crevices. Alder Creek, Cobb Mtn., 7087; Jones Creek, Boggs Mtn. State Forest, 7290; N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7421; Grizzly Canyon N of Elk Mtn., MNF, 7965. This moss with its complanate shoots and dentate leaf tips grows in constantly wet areas in the county. Along the coast it grows in more varied habitats.

Pseudobraunia californica (Lesquereux) Brotherus (Hedwigiaceae). Common. On exposed to shaded boulders and cliff faces, often with *Anacolia menziesii* and *Grimmia leibergii*. Mt. Sanhedrin, MNF; *A. Eastwood s.n.* (CAS); Clear Lake State Park, 7164; Boggs Lake, 5213; Mt. Konocti near summit, 7878.

Pseudocrossidium hornschruchianum (Schultz) R.H. Zander (Pottiaceae). Rare. In sun on consolidated alluvium along seasonal stream. Tributary to North Fork of Cache Creek, 0.5 mi S of Redbud Trailhead, 9947. This species has short-lanceolate leaves which contrast with the ovate to ovate-deltoid leaves of *P. obtusulum* (Lindberg) H.A. Crum & L.E. Anderson. This sole collection is without sporophytes and the plants appear to be exclusively female. The plants have strongly differentiated perichaetial leaves as described for the species (Zander 2007).

Pseudocrossidium obtusulum (Lindberg) H.A. Crum & L.E. Anderson (Pottiaceae). Infrequent. On sunny, bare soil in grassland areas. Along Manning Creek, Hwy 175, four mi W of Lakeport, 7002a; Eight Mile Valley, South Cow Mtn. BLM Recreation Area, 7010; Chalk Mtn., north fork of Cache Creek, 7312; N end of Bachelor Valley S of Hells Peak, admixture in a collection of *Gemmabryum*

violaceum, 843a. The first report of this terricolous moss was from southern California just N of the Mexican border (Eckel et al. 1997), but it is actually widespread in the state at lower elevations.

Pseudoleskea incurvata var. *tenuiretis* (Culmann) Podpěra (Leskeaceae). Rare. On moist boulders along stream. Snow Mtn. Wilderness NW of Milk Ranch, MNF, 9157; same locality, 9159 (ver. by J. Spence).

Pseudoleskea patens (Lindberg) Kindberg (Leskeaceae). Rare. On shaded boulders, higher elevations, above 5000 ft. Snow Mtn. Wilderness near Cedar Camp, MNF, 1397 (SFSU); headwaters of Bear Creek, Snow Mtn. Wilderness, MNF, 7841; head of Mill Creek, Mt. Sanhedrin, MNF, 8077; N slope of Kneecap Ridge, tributary to Sheep Creek, MNF, 8833.

Pseudoleskea radicata (Macoun) Kindberg (Leskeaceae). Rare. On shaded metavolcanic rock in Red Fir Forest. Slope above Stony Creek and Long Glade tributary confluence, Snow Mtn. Wilderness, MNF, 9456.

Pterigynandrum filiforme Hedwig (Pterigynandraceae). Infrequent. On shaded boulders and trunks of bigleaf maple and white alder. Near Tule Lake, Mt. Sanhedrin, MNF, 1269 (SFSU); Mill Creek, Mt. Sanhedrin, 7142; tributary to Stony Creek, Snow Mtn. Wilderness, MNF, 5351. The delicate, pale green plants with blunt-tipped leaves distinguish this moss, which grows at higher elevations in the county.

Ptychomitrium gardneri Lesquereux (Ptychomitriaceae). Occasional. On exposed to shaded rocks, rarely on old wood. Dashiells, Mt. Sanhedrin, MNF, *A. Eastwood s. n.* (CAS); Cobb Mtn., E slope, 7124; trail from Copper Butte to Eel River along Forest Rd M3, MNF, 5160; N of confluence of St. Helena and Putah creeks, 7303.

Ptychostomum bimum (Schreber) J.R. Spence (Bryaceae). Rare. On soil over rock in stream channel. E of Crockett Peak and SW of Waters Camp, Snow Mtn. Wilderness, MNF, 9927 (ver. by J. Spence). This differs from *Ptychostomum pseudotriquetrum* (Hedwig) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pederson in its synoicous inflorescences, non-decurrent leaf bases, and smaller leaf cells. It is probably more common in the county than this sole record indicates.

Ptychostomum creberrimum (Taylor) J.R. Spence & H.P. Ramsay (Bryaceae). Infrequent. On damp to dry, bare soil. Rd to Timber Lake, Snow Mtn. Wilderness, MNF, 8447; Mt. Sanhedrin above Mill Creek Crossing, MNF, 8085; McLaughlin Reserve near Morgan Valley, 8622.

Ptychostomum cyclophyllum (Schwägrichen) J.R. Spence (Bryaceae). Infrequent. On wet, sandy soil along small streams. Copsey Creek E of Lower Lake, 7324; along Morgan Valley Rd, 7052; North Cow Mtn. BLM Recreation Area, Oakwood Springs, 6889 (ver. by J. Spence); Old Long Valley Rd, 7368.

Ptychostomum pacificum J.R. Spence & Shevock. (Bryaceae). Infrequent. In wet montane meadows, often with corn lily (*Veratrum californicum* Durand). Mt.

Sanhedrin, headwaters of Mill Creek, MNF, 7633; N slope of Hull Mtn., MNF, 7620; Milk Ranch Meadow, Snow Mtn. Wilderness, MNF, 9151; East Peak, Snow Mtn. Wilderness, MNF, 9167.

Ptychostomum pallens (Swartz) J.R. Spence (Bryaceae). Rare. On wet soil on pond margins at moderate elevations. Tule Lake, Mt. Sanhedrin, MNF, 7217; Summit Lake between Mt. Sanhedrin and Hull Mtn., MNF, 7193 (ver. by J. Spence).

Ptychostomum pallescens (Schleicher ex Schwärchen) J.R. Spence (Bryaceae). Occasional. On wet soil in seepage areas. Roadside along Corbin Creek, MNF, 5058b; Forest Rd M10 near Blue Slides Lake, MNF, 5265; Goat Mtn. S of Addington Springs, MNF, 7561; Ericson Ridge, Mt. Sanhedrin, MNF, 7137.

Ptychostomum pseudotriquetrum (Hedwig) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pederson (Bryaceae). Common. On moist soil or rock in sun or shade. Low Gap S of Sheetiron Mtn., *Shevock & Toren* 18786; North Cow Mtn. BLM Recreation Area, CDF water tank, 6951; Alder Creek, Cobb Mtn., 7098; East of Crockett Peak, SW of Waters Camp, MNF, 9923 (det. by J. Spence).

Ptychostomum turbinatum (Hedwig) J.R. Spence (Bryaceae). Rare. On soil over rock along stream, also along drainage of alkaline seep. Canyon below Hells Peak, 935 (SFSU) (det. by J. Spence); below Forest M1 W of Scott Dam, MNF, 9581a (det. by J. Spence).

Ptychostomum weigeli (Sprengel) J.R. Spence (Bryaceae). Rare. In wet montane meadows. N cirque of Hull Mtn., MNF, 7234; head of Mill Creek, Mt. Sanhedrin, MNF, 8075; N cirque, Snow Mtn. Wilderness, MNF, 9175. This is easily recognized by its pale tufts with distinctively shaped, widely spaced leaves with decurrent bases.

Rhizomnium glabrescens (Kindberg) T.J. Koponen (Mniaceae). Rare. On shaded, wet rotten wood or shaded mineral soil. Alder Creek, Cobb Mtn., 7084; between Summit Lake and Smokehouse Creek, MNF, 7188.

Rhynchostegium aquaticum A. Jaeger (Brachytheciaceae). Infrequent. Aquatic, in flowing water or in splash zones. Alder Creek, Cobb Mtn., 7096; stream near Forest Lake, Hwy 175, 7264; Snow Mtn. Wilderness, Copper Butte Creek, MNF, 8451; Robert Lewis Stevenson State Park, Troutdale Creek, 8418. Plants from California have long been known as *Platyhypnidium riparioides* (Hedwig) Dixon. See discussion regarding nomenclature of this taxon in Ignatov (2014).

Rhytidadelphus triquetrus (Hedwig) Warnstorf (Hypnaceae). Rare. On litter of Douglas fir and Brewer oak. Near Low Gap and Round Mtn., just S of the Glenn County line, MNF, 8805, 8847.

Rosulabryum bornholmense (Winkelman & R. Ruthe) J. R. Spence (Bryaceae). Rare. On sunny volcanic soil. Boggs Mtn. State Forest, E of Calso Camp, 9846. This has been confused with *R. rubens* (Mitten) J.R. Spence (Crundwell and Whitehouse 2001). The two are

distinguished by size, color, and position of their rhizoidal tubers as well as the shape of the tuber cells. *Rosulabryum bornholmense* is thought to be a plant of acidic soils.

Rosulabryum canariense (Bridel) Ochyra (Bryaceae). Common. On soil, duff, or rock, often with other mosses. Blue Lakes, old county road, 5005; Crockett Camp, Snow Mtn. Wilderness, MNF, 5140; Clear Lake State Park, 7040; Grizzly Canyon N of Elk Mtn., MNF, 7956.

Rosulabryum capillare (Hedwig) J.R. Spence (Bryaceae). Common. On soil or rock, various exposures. Mt. Sanhedrin, Mill Creek, MNF, 7194 (ver. by J. Spence); Morgan Valley Rd E of Lower Lake, 7047; Clear Lake State Park, 7159; E slope Cobb Mtn., 7128

Rosulabryum elegans (Nees) Ochyra (Bryaceae). Rare. In shaded, calcareous rock crevices. W of Low Gap and S of Sheetiron Mtn., MNF, 7724 (det. by J. Spence); rock outcrop, headwaters of Cold Creek, two mi N of Crockett Peak, 9888.

Rosulabryum erythroloma (Kindberg) J.R. Spence (Bryaceae). Infrequent. On shaded soil, over duff or on shaded rock outcrops. Mt. Sanhedrin, Ericson Ridge MNF, 7269 (det. by J. Spence); Hull Mtn. above Timberline Camp, MNF, 7176; E slope Cobb Mtn., 7123; Mt. Konocti at Buckingham Bluffs, *Shevock* 20605 (CAS, UC).

Rosulabryum flaccidum (Bridel) J.R. Spence (Bryaceae). Rare. On exposed soil over rock. Hidden Valley N of Middletown, 7577 (ver. by J. Spence); Goat Rock NW of Middletown and SW of Harbin Springs, 10129. This small *Rosulabryum* J.R. Spence resembles *R. capillare* but has filamentous axillary gemmae.

Rosulabryum gemmascens (Kindberg) J.R. Spence (Bryaceae). Infrequent. On sunny bare soil and old masonry walls. S shore of Clear Lake at Konocti Harbor Inn, 8972; Manning Creek, four mi W of Lakeport on Hwy 175, 9601c; meadow at end of Conestoga Rd, Hidden Valley, 9781; Mariah Meadows resort S of Mt Hannah, 9841 (ver. by J. Spence).

Rosulabryum rubens (Mitten) J.R. Spence (Bryaceae). Infrequent. On soil or rock in disturbed areas. South Cow Mtn. BLM Recreation Area, staging area, 6924; Knoxville BLM Recreation Area, Round Mtn., 7066 (det. by J. Spence); Library Park, Lakeport, 7667; base of Mt. Konocti at Little Borax Lake, 7851.

Rosulabryum torquescens (Bruch & Schimper) J.R. Spence (Bryaceae). Rare. On dry soil. E of Hwy 29 at Robinson Creek and Bridge Arbor Rd, 8667 (ver. by J. Spence); Scotts Valley Rd W of Lakeport, 8723; Forest Rd M1 two mi N of Upper Lake Ranger Sta., 9613a.

Schistidium cinclidodonteum (Müller Hal.) B. Bremer (Grimmiaceae). Occasional. On rocks in intermittent streams. Horse Glade Camp, Goat Mtn., MNF, 5260 (det. by H. Blom); Sweetwater Creek, Hidden Valley, 5196a; Snow Mtn. Wilderness, Milk Ranch Trail, MNF, 7470; W of Low Gap and S of Sheetiron Mtn., MNF, *Shevock* 18787 (CAS, UC) (det. by H. Blom).

Schistidium confertum (Funck) Bruch & Schimper (Grimmiaceae). Rare. On shaded boulders, Snow Mtn. Wilderness, MNF, West Crockett Campground, 5140a; below West Peak, 7469 (det. by H. Blom); near Milk Ranch, 1970 (SFSU); Rattlesnake Creek below Hull Mtn. summit, *Ma 14-5866* (CAS, KUN).

Schistidium dupretii (Thériot) W.A. Weber (Grimmiaceae). Rare. On soil over rock in crevices. Near Milk Ranch, Snow Mtn. Wilderness, MNF, 1970. (SFSU) (ver. by T. McIntosh). *Schistidium dupretii*, similar in size to *S. confertum*, differs from the latter in having mucicous leaves with oblate basal marginal cells, and perichaetial leaves not concealing the capsules, which are often striolate when dry.

****Schistidium echinatum** Ignatova & H.H. Blom (Grimmiaceae). Rare. On exposed metavolcanic rock. Ridgetop E of Crockett Peak just N of Snow Mtn. Wilderness, MNF, 9500b (MW) (det. by E. Ignatova). The Lake County collection represents the only known North American site for this recently described species, otherwise known from across Eurasia (Ignatova et al. 2011).

***Schistidium flaccidum** (De Notaris) Ochyra (Grimmiaceae). Rare. On exposed rock at the highest elevations. Above Timberline Camp, Hull Mtn., MNF, 779 (SFSU), 7176b; West Peak, Snow Mtn. Wilderness, MNF, 7505 (det. by H. Blom); N of East Peak, Snow Mtn. Wilderness, MNF, 7503. This rare *Schistidium* can easily be confused with *Grimmia anodon* and the two can grow sympatrically.

Schistidium rivulare (Bridel) Podpěra (Grimmiaceae). Infrequent. On rocks in streams and snowmelt drainages. Snow Mtn. Wilderness below West Peak, MNF, 7467; Hull Mtn., N cirque, MNF, 7242; Eel River at Copper Butte Creek confluence, MNF, 5164a; Grizzly Canyon N of Elk Mtn., MNF, 7971 (ver. by H. Blom).

Schistidium splendens T.T. McIntosh, H.H. Blom, D.R. Toren & Shevock (Grimmiaceae). Occasional. This is a recently described species in the *S. apocarpum* complex, related to the boreal/alpine *S. pulchrum* (McIntosh et al. 2015). It is known from the coastal ranges from British Columbia to California. This moss forms relatively delicate, loose glossy tufts on boulders along streams and rock outcrops with runoff. It occurs mostly in the northern part of the county. The Big Openings above Cedar Creek, MNF, 8098; Ericson Ridge, Mt. Sanhedrin, MNF, 5078; Rattlesnake Creek along Forest Rd M-6, MNF, 8103; Pine Mtn., headwaters of Benmore Creek, MNF, 7981. The type locality is Boggs Mtn. State Forest.

Schistidium squarrosus T.T. McIntosh, H.H. Blom, D. R. Toren & Shevock (Grimmiaceae). Occasional. This is another recently described species related to *S. cinclidodontum* (McIntosh et al. 2015). It differs from the latter in having ovate-lanceolate rather than linear-lanceolate leaves, which are squarrose when wet whereas the leaves of *S. cinclidodontum* when wet tend to be falcate-secund. Its habitat is rock outcrops with minimal runoff whereas *S. cinclidodontum* occurs in stream channels with running water at least part of the year. This moss is widespread in Lake County: Forest Rd M12 from Nice to Bartlett Mtn., MNF, 8127; the Slides W of Lake Pillsbury, MNF, 7535; North Cow

Mtn. BLM Recreation Area at CDF water tank, *Shevock 16894* (CAS); Manning Creek, four mi W of Lakeport on Hwy 175, 7405.

Sciuro-hypnum oedipodium (Mitten) Ignatov & Huttunen (Brachytheciaceae). Rare. On damp soil over duff. Mt. Sanhedrin above Mill Creek Crossing of Forest Rd 20N04, MNF, 7140 (ver. by M. Ignatov).

Scleropodium californicum (Lesquereux) Kindberg (Brachytheciaceae). Rare. On soil of steep road bank in diffuse light. N base of Mt. Konocti at Soda Bay, 8536 (ver. by B. Carter); Clear Lake State Park near Kelsey Creek Slough, 6850. Carter (2012) mapped the distribution of this moss with most localities being coastal and with concentrations around San Francisco Bay. Inland sites are apparently rare.

Scleropodium cespitans (Müller Hal.) L.F. Koch (Brachytheciaceae). Common. On shaded rock, soil, and tree bases. Western Mine Rd N of Mt. St. Helena, 5222 (det. by Norris); Clear Lake State Park, 6837; Old County Rd, Blue Lakes, 5008; N end of Bachelor Valley S of Hells Peak, 337 (SFSU).

Scleropodium julaceum E. Lawton (Brachytheciaceae). Occasional. On soil and tree bases. Pogie Point Campground, Lake Pillsbury, MNF, 5045; vernal pool E of Tule Lake, Mt. Sanhedrin, MNF, 7204; Bucknell Creek, N of Garrett Mtn., MNF, 7420; Little Borax Lake, base of Mt. Konocti, 7855. This species is rather small, usually growing in compact mats, and the branches are strongly julaceous due to the appressed and imbricate leaves (Lawton 1967). However, it can grow in vernal pools where its growth habit is much altered.

Scleropodium occidentale B.E. Carter (Brachytheciaceae). Infrequent. Growing in splash zone of small streams. Boggs Mtn. State Forest, *B.E. Carter 6792*; Steep canyon of Knibb Ranch S of Kelseyville, 29 Mar 2012, *B.E. Carter 6847* (UC). Carter (2012) recently described this species that is close to *S. obtusifolium* (Mitten) Kindberg using molecular tools as well as pointing out morphological and ecological differences.

Scleropodium obtusifolium (Mitten) Kindberg (Brachytheciaceae). Common. Semiaquatic on rock or exposed roots. Schwartz Spring, Cobb Mtn., 5207; Crabtree Hot Springs, MNF, 5242; Hells Peak, 305 (SFSU); W of Low Gap S of Sheetiron Mtn., MNF, 7725.

Scleropodium touretii (Bridel) L.F. Koch (Brachytheciaceae). Common. On shaded soil, often on roadbanks. Deer Valley Campground, MNF, 8007; Clear Lake State Park, 6823; Complexion Springs N of Indian Valley Lake, 931 (SFSU); two mi W of Big Rock N of Deer Valley, MNF, 8004.

Scouleria aquatica Hooker (Scouleriaceae). Rare. On rock in intermittent waterfall. W slope of Crockett Peak, tributary to Stony Creek, Snow Mtn. Wilderness, MNF, 7591; Mill Creek below Tule lake near crossing of Forest Rd 19N17, Mt. Sanhedrin, MNF, 9105.

Syntrichia caninervis Mitten (Pottiaceae). Rare. On dry calcareous soil and travertine. Grizzly Springs along

Hwy 20, 2849 (SFSU); same locality, 6821; base of Chalk Mtn., north fork of Cache Creek, 7329 (ver. by B. Mishler). These populations are a western outlier of a broader distribution in the eastern Sierra Nevada and Great Basin.

Syntrichia laevipila Bridel (Pottiaceae). Common. On bark of hardwoods, not present at the highest elevations. Clear Lake State Park, 7038; Buckingham Bluffs, Mt Konocti 8646; Lakeport, Lake County Museum grounds, 9457; Big Canyon Rd along Putah Creek, 7292.

**Syntrichia laevipila* Bridel var. *meridionalis* (Schimper) Juratzka (Pottiaceae). Rare. On bark of valley oak (*Quercus lobata*) and California bay (*Umbellularia californica*). Middletown, Central Park, 7349; Hwy 20 at Nice, 7708 (ver. by B. Mishler); Middletown County Park W of Middletown, 9406, 9851.

Syntrichia latifolia (Bruch ex Hartman) Huebener (Pottiaceae). Common. On shaded hardwood bark, rarely on rock. S of Hells Peak, 650 (SFSU); Hells Half Acre along Putah Creek, 8494; Rodman Slough, N shore of Clear Lake, 8528; Big Canyon Rd along Putah Creek, 7251. This species, with its muticous and gemmae bearing leaves, is often found in or near inundation zones of streams and lakes.

Syntrichia montana Nees (Pottiaceae). Occasional. On sunny rock or thin soil over rock. Forest Rd M1 one mi N of Middle Creek Campground, MNF, 9613b; Forest Rd M10, Bartlett Mtn. near Ruppert Ridge, MNF, 9622; Snow Mtn. Wilderness near Cedar Camp, MNF, 9442; Hells Peak, 6863.

Syntrichia norvegica F. Weber (Pottiaceae). Rare. On soil or rock. Snow Mtn. Wilderness, N of east peak, MNF, 7504; Ridge E of Crockett Peak just N of Snow Mtn. Wilderness, MNF, 9405; 0.5 mi N of Cedar Camp along Milk Ranch trail. MNF, 9440 (ver. by K. Kellman).

Syntrichia papillosa (Wilson) Juratzka (Pottiaceae). Rare. On bark of cultivated trees, probably introduced. Middletown, on walnut, 7250; Upper Lake Ranger Sta., on apple, 7436; Lakeport, Library Park, on coast redwood, 7897 (ver. by B. Mishler); Lake County Museum grounds, Lakeport, 8144. The gemmae borne on the leaves and simple leaf papillae distinguish this species.

Syntrichia papillosissima (Coppey) Loeske (Pottiaceae). Rare. On soil at edge of alkaline seep. Below Forest Rd M1 W of Scott Dam, Lake Pillsbury area, MNF, 9007 (ver. by K. Kellman); same locality, 9581b; Grizzly Springs along Hwy 20, B Mishler & E. Dearing 3-30-12-C (UC).

Syntrichia princeps (De Notaris) Mitten (Pottiaceae). Common. On soil and tree trunks in sun or shade. Clear Lake State Park, 6854; Lower Nye Camp, Skeleton Creek, MNF, 5343; Anderson Marsh State Historic Park, 6813; Hunter Point, Middle Mtn., MNF, 7705 (det. by B. Mishler).

Syntrichia ruralis (Hedwig) F. Weber & D. Mohr (Pottiaceae). Common. On sunny or shaded rock, all elevations. Snow Mtn. Wilderness, west peak, MNF, 7517; Hells Peak, 6861; North Cow Mtn. BLM Recreation Area, head of Scotts Creek, 6969; Knoxville

BLM Recreation Area, Round Mtn., 7067 (det. by B. Mishler).

Syntrichia virescens (De Notaris) Ochyra (Pottiaceae). Rare. On shaded rock, high elevations. Snow Mtn. Wilderness, N of East Peak, MNF, 7513 (det. by K. Kellman); tributary to Bear Creek N of Cedar Camp, 9442.

Timmiella anomala (Bruch & Schimper) Limpricht (Pottiaceae). Rare. On sunny or shaded soil. Hwy 175 E of Lakeport near South Fork of Scotts Creek, 9647 (det. by R. Zander). BLM Cache Creek Management Area, Redbud Trail, 9865.

Timmiella crassinervis (Hampe) L.F. Koch (Pottiaceae). Common. On sunny or shaded soil, or soil over rock, not at the highest elevations. Boggs Mtn. State Forest, Spikenard Creek, 7111; Mt Konocti below Buckingham Bluffs, Shevock 20607 (ver. by R. Zander); Middletown County Park, 9407 (ver. by R. Zander); Middle Mtn. near Hunter Point, MNF, 7707a. This plant has glistening, yellow-green and spreading leaves when wet, but when dry the strongly incurved leaves display a shiny yellow costa.

**Tortella alpicola* Dixon (Pottiaceae). Rare. In shaded limy crevices of metavolcanic rock. W of Low Gap and S of Sheetiron Mtn., MNF, Shevock 15866 (BUF, CAS) (det. by P. Eckel) and same locality, 7714. This species was first reported from North America as *T. tortelloides* (Greene) Robins. (Eckel 1991). Zander (1993) found that *T. alpicola* is an older name for *T. tortelloides*. This is the sole California locality for this moss.

Tortula amplexa (Lesquereux) Steere (Pottiaceae). Rare. On moist soil banks near streams. Meadow E of Hells Peak, 1049 (SFSU); Hwy 20, 10.3 mi E of Hwy 53 jct, 7332, BLM Cache Creek Management Area, K. Kellman 6837. The perichaetial leaves, which sheath the base of the seta, can be seen with a 10× hand lens.

Tortula bolanderi (Lesquereux) M. Howe (Pottiaceae). Common. On sunny or shaded bare soil, sometimes in moist crevices. Below Hells Peak, 654 (SFSU); Bottlerock Rd near Boggs Lake, 838 (SFSU); Lower Nye Camp, MNF, 5332; near Harbin Springs, 7282. This species is slightly larger than *T. amplexa*, has stouter capsules and lacks the sheathing perichaetial leaves of the latter.

Tortula brevipes (Lesquereux) Brotherus (Pottiaceae). Infrequent. On sunny, dry soil. Chalk Mtn., north fork of Cache Creek, 7298; Hwy 20 and new Long Valley Rd, 7301; N end of Bachelor Valley, 1037 (SFSU); Clear Lake State Park, 7046.

Tortula brevissima Schiffner (Pottiaceae). Rare. On old cement bridge abutment in sun. St Helena Creek bridge, eastern part of Middletown, 9956 (ver. by K. Kellman). Kellman (2012) reported this species as new to North America from the coastal counties of Monterey, Santa Cruz and San Mateo. It resembles *T. atrovirens* but has a hair point. It can also be confused with *T. muralis*, but that species lacks the adaxial pad of radially elongate cells present in *T. brevissima*.

Tortula guepinii (Bruch & Schimper) Brotherus (Pottiaceae). Rare. On sunny soil over rock. S of Hells

Peak, 1076 (SFSU); Manning Creek, four mi W of Lakeport on Hwy 175, 6997; Hells Half Acre along Putah Creek, 8492; Forest Rd M1, one mi N of Middle Creek Campground, MNF, 9020. Microscopically, this species has cells of the upper leaf margins distinctly less papillose than those toward the costa.

Tortula muralis Hedwig (Pottiaceae). Occasional. On sunny rock, often on concrete and brickwork. Main Street and Konocti Rd, 7658a; Hwy 20 and Main Street, Upper Lake, 7432; Middletown at Old St. Helena Creek bridge, 8935. This is a cosmopolitan plant, widely known as an urban moss.

Tortula plinthobia (Sullivant & Lesquereux) Brotherus (Pottiaceae). Rare. On sunny volcanic soil over rock. Coyote Creek inlet to Hidden Valley Lake, 9468 (ver. by R. Zander). This species can be separated from *Tortula muralis* by its shorter peristome.

Tortula protobryoides R.H. Zander (Pottiaceae). Rare. On sunny, dry soil. Hwy 53, one mi S of Hwy 20 jct, Norris 47705 (UC).

Tortula subulata Hedwig (Pottiaceae). Occasional. On sunny to shaded soil, more common at higher elevations. Bottlerock Rd S of Kelseyville, 659 (SFSU); Cobb Mtn. near Alder Creek, 7085; Ericson Ridge, Mt. Sanhedrin, MNF, 5079; off Socrates Mine Rd W of Castle Rock Springs, 7400.

Trachybryum megaptitum (Sullivant) W.B. Schofield (Brachytheciaceae). Rare. On shaded conifer or hardwood litter. Forest Rd M1 between Pine Mtn. Rd and Violet Spring, MNF, 7435; tributary to Willow Creek E of Forest Rd M1, MNF, 7455; Grizzly Canyon N of Elk Mtn., MNF, 7970; Mill Creek below Tule Lake near crossing of Forest Rd 19N17, MNF, 9106. The genus *Trachybryum* (Brotherus) W.B. Schofield has been retained by this author. However, Ignatov and Huttunen (2002) opined *Trachybryum* is well nested within *Homalothecium* Schimper. [= *Homalothecium megaptitum* (Sullivant) H. Robinson].

****Trichodon cylindricus*** (Hedwig) Schimper (Ditrichaceae). Rare. On silty bank of rivulet in shade, at 6300 ft. N cirque of Hull Mtn., MNF, 7622 (coll. E. Dearing, ver. by R. Ireland). Ireland (1978) mapped the distribution of this species in western North America from northern Oregon, Idaho, and Montana northward to Alaska. Its small size may be the reason it is overlooked.

****Trichostomum brachydontium*** Bruch (Pottiaceae). Rare. On soil in rock crevices. Forest Rd M12 to Bartlett Mtn., 1.2 mi from Hwy 20, 9377 (ver. by R. Zander).

Weissia controversa Hedwig (Pottiaceae). Common. On bare soil in sun or open shade, usually on banks, lower elevations. Cobb Mtn., E slope, 7129; Morgan Valley, 7049; Hells Peak, 6859; Spruce Grove Rd S of Lower Lake, 7074. When moist the leaves of this moss show incurved leaf margins and when dry they are strongly crisped.

Weissia inoperculata (H.A. Crum) H.A. Crum, Steere, and L.E. Anderson (Pottiaceae). Rare. On seasonally moist soil in sunny meadow. Hidden Valley at end of

Conestoga Rd, 9780 (ver. by R. Zander). Based on the specimen cited here, Toren and Dearing (2011) gave an accounting of the first authentic material collected since its discovery on the campus of Stanford University, Santa Clara County (Crum 1957).

Weissia ligulifolia (E.B. Bartram) Grout (Pottiaceae). Rare. On exposed serpentine soil over rock. N of Middletown along St. Helena Creek, 7305; three mi N of Middletown along Hwy 29, 9734 (ver. by R. Zander); Grizzly Springs along Hwy 20, 9952.

Zygodon rupestris Schimper ex Lorentz (Orthotrichaceae). Infrequent. On shaded hardwood tree bases, rarely on shaded boulders. S of Hells Peak, 976 (SFSU); Alder Creek, Cobb Mtn., 7344 (ver. by D. Vitt); N slopes of Garrett Mtn. above Bucknell Creek, MNF, 7407; one mi W of Soda Creek W of Lake Pillsbury, MNF, 7360 (ver. by D. Vitt). This species forms small, light green tufts and its leaves have a terminal smooth, elongate cell that is visible with a 20× hand lens. The septate, torpedo-shaped gemmae are highly diagnostic.

APPENDIX 2

Lake county mosses occurring only on Snow Mountain and immediate vicinity.

Brachytheciastrum collinum
Coscinodon calyptratus
Cratoneuron filicinum
Didymodon californicus
Eurhynchiastrum pulchellum
Fontinalis chrysophylla
Gymnostomum aeruginosum
Gemmabryum kunzei
Imbribryum mildeanum
Isopterygiopsis pulchella
Meiotrichum lyallii
Mnium marginatum
Orthotrichum alpestre
Platydictya jungermannioides
Pohlia bolanderi
Pseudoleskea incurvata var. *tenuiretis*
Pseudoleskea radicata
Schistidium confertum
Schistidium echinatum
Syntrichia virescens

APPENDIX 3

Taxa occurring in Lake County for which statewide conservation efforts have been applied. Listings and ratings are subject to change and are not included here. An asterisk (*) preceding the scientific name indicates that species is known from Lake County from only one occurrence.

Didymodon norrisii. This highly distinctive moss has been more widely collected in recent years and is now considered much more common than originally thought. Therefore, it has been given a lower ranking in the CNPS inventory. It is widespread in Lake County.

Grimmia torenii. Apparently this *Grimmia* is endemic to the coastal mountains of central California. It should be sought in the counties of Marin, Napa, Solano,

Sonoma, and Yolo. For a more detailed account of this species, see Hastings (2008).

**Mielichhoferia elongata.* Although known from several counties in California, populations are small and highly localized. Search efforts for this moss should be concentrated on damp to moist, highly acidic rock and soils with elevated levels of heavy metals or sulfur. For more details and illustrations of this unique plant, see Malcolm et al. (2009).

**Plagiobryoides vinosula.* Known from California for less than 10 years, this moss is somewhat nondescript. Search efforts should be focused on calcareous springs, including hot springs. It is more common in the desert areas of southern California and southward into México.

**Schistidium echinatum.* The only known site in North America for this otherwise Eurasian species is Lake County, California. Its occurrence on U.S. Forest Service lands should ensure its protection.

**Tortella alpicola.* Currently the Lake County collections are the only California records for this taxon. It is afforded some protection by its occurrence on U.S. Forest Service lands. Surveys in montane areas with calcareous rock are likely to reveal more localities in California.

**Trichodon cylindricus.* The population from the north slope of Hull Mountain is on U. S. Forest Service lands, giving it protection. Though it is more common north of California, only a few small populations have been found elsewhere in the state, specifically the Klamath Region and the northern Sierra Nevada.

**Weissia inoperculata.* Only two recent records are known for this California endemic moss. For an historical account, see Toren and Dearing (2011). The Lake County occurrence is on private land.

PRESIDENT'S REPORT FOR VOLUME 62

Dear Colleagues,

As most of you probably know, the face of botany has been changing for many years. The former model of academic botany continues to transition into non-academic botany, with a large proportion of botanists now working for government agencies and environmental consulting firms. One of the ways we are trying to serve the membership is by understanding how botany is changing in the western U.S. and using that knowledge to modify how the Society uses its resources. We appreciate input from the membership to help guide us through these changes so that we can become as relevant and helpful to our membership as possible. The council members and I are eager to hear from you.

Madroño continues to be on time, with the average time between submission and publication being less than eight months. The Society continues to encourage submissions to the journal

as the best outlet for botany in Western North America. We're excited to publish a special issue about mosses in California, which consists of three localized bryofloras. Such studies continue to advance our understanding of the distribution,

As a result of rising costs, the Society will be raising its membership rates to the following: Students \$30, Emeriti \$35, Institutions \$85, Individual \$50, Family \$55, Life \$1000. Rates will be raised on January 1, 2016. However, you can renew your membership at the old rate if you renew by the end of the year. It has been a long time since the Society has raised its rates. The council was reluctant to make this change, but it is necessary to allow us to promote the mission of the Society.

Thank you for your continued support.
Mark Brunell, August 2015

EDITOR'S REPORT FOR VOLUME 62

I am pleased to report the publication of volume 62 of *Madroño* by the California Botanical Society (CBS) in 2015.

The publication of *Madroño* remains on schedule with an average time between initial submission and publication of about 8 months. I hope that *Madroño* continues to be viewed as the best outlet for western botanists to publish their work in a timely fashion, while reaching an interested and relevant audience.

The efforts of numerous individuals are critical to the continued quality of the journal. Chief among these are the editorial assistant, Genevieve Walden and Note-worthy Collections editor, David Keil. Steve Timbrook

has long provided the Volume Index and Table of Contents for the journal and I thank him for his efforts. I am particularly grateful to our reviewers who volunteer time from their busy schedules to assess the quality of submitted work.

It is an honor to continue to be Editor of *Madroño* and interact with so many great contributors and reviewers. Please continue to submit your work to the journal and have a great year.

Matt Ritter
September 2015

REVIEWERS OF MANUSCRIPTS

Alan Smith
Ben Carter
Brian Anacker
Clyde Calvin
David Keil (5)
David Wagner
Dorothy Fabijian
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Peter Fritsch
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Stephen Myers
Susan Bainbridge
Thomas Stoughton
William Buck
William Smith

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DEDICATION TO ROBERT PATTERSON

This year the California Botanical Society is pleased to dedicate this volume of *Madroño* to Robert (Bob) Patterson, Professor of Biology, San Francisco State University.

Bob was born and raised in California, a true native of the state. He earned his B.A. in 1969 at the University of California, Santa Barbara where his interest in the California flora first began. He continued his studies at UCSB, earning his Ph.D. in 1975 working on the biosystematics of *Linanthus* (Polemoniaceae), a group he would continue to work on throughout his career.

Bob took his first, and last, faculty position at San Francisco State University in 1979, although he did serve as a visiting senior lecturer at the University of the Witwatersrand, Johannesburg, South Africa in 1985. While at SFSU, Bob has provided countless hours of service to the Department of Biology and the Herbarium at San Francisco State.

Over the past 35 years, Bob's lab has focused on the systematics of Polemoniaceae and Hydrophyllaceae. His lab group has contributed tremendously to our understanding of relationships among closely related species of western North American genera of these families. Research in his lab used an array of approaches ranging from morphometrics to ascertain species limits to molecular sequence analysis to infer evolutionary histories of species. Results from the lab have been key to understanding the evolution of many morphological characters that have been traditionally used to classify these diverse taxa. In addition to his numerous research publications, Bob has contributed several taxonomic treatments to the *Jepson Manual* (e.g., Boraginaceae, Hydrophyllaceae, and Polemoniaceae) and numerous genera within these groups. He has served on the Editorial Board of the *Jepson* since 1985 and was an editor for the second edition of the *Manual*. In addition to his floristic work in California, Bob wrote the treatment for the Goodeniaceae for the *Manual of Flowering Plants of Hawai'i*, and has contributed to the *Flora of North America*.

Throughout his career Bob taught courses in general biology, plant taxonomy, plant anatomy, ethnobotany, field botany of the Sierra Nevada, and biogeography, as well as mentored numerous graduate students and has served on many Master's thesis and exam committees. Graduate students in Bob's lab (of which there have been over 35) learn important aspects of plant systematics regarding data collection (in the field as well as the laboratory), phylogenetic analysis, and how to publicly present and publication of their research. Bob's students have always been well represented at local and national botanical meetings. Upon completion of their degrees, most of Bob's students have gone on to Ph.D. programs all over the country and are still contributing to the knowledge and conservation of the California flora.

Beyond his research and teaching, Bob's contributions to the Californian botanical community have been nothing short of remarkable! He served as President of the California Botanical Society from 1989 to 1992, and as



Editor-in-Chief for *Madroño* from 1993 to 1996. In addition to being a Fellow and Research Associate at the California Academy of Sciences since 1984 and Trustee at Strybing Arboretum Society from 1989 to 1991.

Bob is perhaps at his best when teaching students in the field. His Plant Taxonomy course at SFSU was among the most popular courses taught each spring and was nothing short of legendary! Most every weekend was spent in the field where students were exposed to a wide variety of habitats in California. At each stop along the way students were treated to an impromptu lecture full of botanical information, with students hanging on Bob's every word. His love of California and its flora is

infectious. Students not only developed an appreciation and knowledge for the plants of California, but also gained an overall appreciation for the natural world and the study of biology.

The botanical world has been blessed with Bob's talent and kind heart.

—CHARLES D. BELL, University of New Orleans, New Orleans, LA 70148. cdbell1@uno.edu

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